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THE SKELETON OF THE IRISH GIANT, CORNELIUS MAGRATH. By D. J. CUNNINGHAM, M.D., LL.D., F.R.S., Professor of Anatomy in the University of Dublin. (Plates VII. and VIII.)

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XVI.

THE SKELETON OF THE IRISH GIANT, CORNELIUS MAGRATH. By D. J. CUNNINGHAM, M.D., LL.D., Professor of Anatomy in the University of Dublin. Plates VII. and VIII.

[Read January 26, 1891.]

It is questionable if there is a Museum specimen in Dublin which is better known, or which has excited a wider interest, than the skeleton of Cornelius Magrath. For one hundred and thirty-one years it has been preserved in Trinity College, and yet it is strange that it has never been properly described nor critically examined. It is true that measurements were sent from Ireland to Professor Sir George Humphry when he was engaged in the preparation of his classical work upon the Human Skeleton,* but I regret to say these were grossly inaccurate, and were apparently supplied chiefly with the view of outrivalling the dimensions of the skeleton of another Irish giant, called Charles Byrne, which is preserved in the Museum of the Royal College of Surgeons in England.

It will be necessary to subtract at least 1 ft. 4 in. from the height of Cornelius Magrath, as stated in Sir George Humphry's book, but this loss will be amply repaid by the other interesting details which the examination of the skeleton has disclosed, and the value of the specimen, instead of being depreciated, will, I believe, be very considerably enhanced. In short, the chief interest attaching to the skeleton does not depend so much upon its gigantic stature as upon the fact that it apparently offers for our study a marked example of that disease which has recently received the extremely clumsy and badly-constructed name of acromegaly.

* "The Human Skeleton," 1858, p. 107.

It is not my intention on the present occasion to discuss the pathological characters of acromegaly. It will be sufficient for the purpose to state that the salient features of the disease consist in a remarkable enlargement of the hands, the feet, and the face. In this excessive growth both soft parts and bones participate, but in very unequal degrees in the case of the distal extremities of the limbs and the face. In the case of the face, the increase is, for the most part, confined to the bones, whilst in the case of the hands and feet, the hypertrophy is chiefly noticeable in connexion with the soft parts. The maxillary bones become greatly elongated, and the lower jaw enlarging in all directions may carry the lower range of teeth in front of the upper range—a condition which gives rise to a most forbidding expression of countenance.

Another character, and it is one of a very extraordinary kind, becomes manifest on *post-mortem* examination. I refer to a great hypertrophy of the pituitary body, with a corresponding expansion of the fossa in which it lies on the floor of the cranium. It is right to state that this feature has not been noted in every case of acromegaly that has been described. In looking over the tabular list of recorded cases which is given in the recent elaborate monograph* on the subject by Professor Julius Arnold, of Heidelberg, I notice a few instances in which the pituitary hypertrophy has not been observed. It may be fairly questioned, however, whether these can be considered as typical examples of the disease. As we shall see later on, the characters which distinguish acromegaly cannot yet be regarded as being definitely established, and several cases which were in the first instance included within the category, have, on more searching investigation, been banished from the list.

It was Marie, who first, in 1886, recognized that the group of conditions to which I have briefly referred, constituted a new disease; and it was he who applied to it the name of acromegaly.† Many isolated

* "Acromegalie, Pachyacrie oder Ostitis? Im anatomischen Bericht über den Fall der Hagner I."—Beiträge zur pathologischen Anatomie und zur allegemeinen Pathologie. Zehnter Band, erstes Heft, Jena, 1891.

† "Sur deux cas d'Acromégalie."—Revue de Médicine. Paris. April, 1886.

cases of a similar nature, however, had been previously noticed and recorded. One of these came under my own observation in 1878 when I held the post of Senior Demonstrator of Anatomy in the University of Edinburgh under Sir William Turner. In the winter session of that year a male subject was placed in the dissecting-room, which excited universal attention. He was a man of unusual bulk, and his features were extremely forbidding. "His head and thorax were peculiarly large; his limbs were spare, although his hands and feet were enormous." Careful notes were taken during the course of the dissection, and at the request of Sir William Turner these were published by me in the *Journal of Anatomy and Physiology.** In this Paper I was so fortunate as to be able to include an admirable account of the clinical features of the case, which was furnished to me by Dr. Claud Muirhead, under whose care the patient had been during the latter part of his life. The merit of having recognized this as being a case of acromegaly belongs to Dr. Henry Alexis Thomson, of Edinburgh, who, in an extremely interesting and important article, has furnished us with an exhaustive description of the macerated skeleton.† It was not until I had read this Paper that I fully realized that we had in Cornelius Magrath an example of acromegaly, although I had often been struck with the many points of similarity which he presented to the specimen which I had studied in Edinburgh. Further, the skeleton of Magrath must be regarded as furnishing us with a case of unusual interest, not only on account of the general gigantic growth which is associated with the disease, but also because I believe that it is the oldest specimen of the kind in existence. Marie quotes a case which occurred in France in 1773.‡ On the death of this individual, his wife would not allow a *post-mortem* examination to be made, and she even carried her respect for her husband's memory to such

* "A large Subarachnoid Cyst, involving the greater part of the Parietal Lobe of the Brain."—Journ. Anat. and Phys., vol. xiii., 1879, p. 509.

† "Acromegaly, with a description of a Skeleton."—Journ. Anat. and Phys., vol. xxiv., 1890, p. 476.

‡ "Revue de Médicine." Tome vi., 1886, p. 316. Quotation from Saucerotte, "Mélanges de Chirurgie," 1801.

an extent that she hired apartments near the cemetery so that she might always have the tomb under her own immediate inspection. Her own death did not take place for a number of years, and then certain of the bones of her husband were procured. These are preserved in the "Musé Dupuytren," and consist of the sternum, the clavicle, and one rib. Magrath died in May, 1760, and his skeleton was mounted shortly afterwards.

Having recognized in the skeleton of Magrath a case of acromegaly, I naturally became anxious to ascertain his history. I was familiar with the many legends which are current in Dublin in regard to him, but most of these bear the stamp of untruth, and even the short record which we possessed in the Museum, except in so far as the dates of his birth and death are concerned, I have since found to be inaccurate. Having applied to Professor Macalister, my distinguished predecessor in the Chair of Anatomy in Trinity College, he referred me to *Faulkner's Journal.** In this, as well as in *Pue's Occurrences*, another newspaper published at that period in Dublin, I found an extremely interesting account of Cornelius Magrath. In both Journals the article is in identically the same words. It runs as follows:—

"Friday, *May* 16:—In College-green died Cornelius M'Grath, the late Irish Giant, born in the County of Tipperary, within five miles of the Silvermines, in the year 1736. His parents were no way remarkable for their stature, being of the middle size, and were common country people; nor were their other children taller than ordinary. In July, 1752, Cornelius was in the City of Cork, being then about sixteen years of age, and was followed about by crowds of people on account of his extraordinary size; for he then measured six feet eight inches and three-quarters. The preceding year he was much afflicted with violent pains in his limbs, for which he bathed in the salt water: however, these were no other than growing pains, for he actually grew from little more than five feet to the above-mentioned stature in the space of one year. The good Dr. Berkeley, then Bishop of Cloyne, kept him at his house for two or three months, and was very charitable and humane to him, and caused great care to be taken of him until he recovered the use of his limbs. His hands were then as large as a middling shoulder of mutton; and the last of his shoe, which he carried about with him, measured fifteen inches. He always eat and drank very moderately; his drink was then chiefly cyder,

* May 16th, 1760.

and that he took only at meals. When he was at Cork he was persuaded to exhibit himself at a show; and he went for that purpose to Bristol, and from thence to London, and an account was given of him in the London Magazine for July 1752. He afterwards went to Paris, and to most of the great cities in Europe. At Florence, one Bianchi, a physician there, wrote a small tract concerning him. About two months ago he returned to his native country, and then measured seven feet eight inches without shoes. When he arrived he was in a very bad state of health, owing, as he said, to an intermitting fever that he had been first seized with in Flanders. His complexion was miserably pale and sallow; his pulses very quick at times for a man of his extraordinary height; and his legs were swollen. Upon his death his body was carried to the Dissecting House in the College; where his skeleton, on account of its extraordinary size, will amuse the curious, and fill posterity with wonder. He was not the only person of a gigantick size born of late years in Ireland; for in the third volume of Lowthorp's Abridgement of the Philosophical Transactions, the late Dr. Molyneux has given an account of one Edmond Malone, whom he measured in this city with his shoes off, and who was seven feet and seven inches high.* Cornelius M'Grath was equal in stature to Daniel Cajanus, the Swedish Giant, who was seven feet and eight inches high; and whose pulse, according to the late Dr. Bryan Robinson, beat fifty-two times in a minute; but M'Grath's, on his arrival here, beat near sixty times a minute. Besides his skeleton (now in preparation), there is at present in the College Anatomy House, that of Clarke, the famous ossified man, whose bones grew altogether into one (the

* The article in which reference is made to Edmond Malone was published by Dr. Molyneux in the Philosophical Transactions, in February, 1700 (No. 261, p. 487), under the title of, "An Essay concerning Giants, occasioned by some further Remarks on the large Human Os Frontis or Forehead Bone, mentioned in the Philosophical Transactions of February, 1684–5, No. 168." Speaking of men of gigantic stature, Dr. Molyneux says:—"The first I shall mention was one I saw and measured myself at Dublin, in the year 1682; his name, Edmond Malone, born in Ireland, at Portlester, a town in the county of Meath; his father, though a proper man, no way remarkable for his height; but his mother was of a more than ordinary low stature. When he stood on the bare ground with his shoes off he measured full seven feet seven inches in height—that is, above two foot taller than a man of common size." It is interesting to note that in the volume of the Philosophical Transactions immediately preceding that in which we find Dr. Molyneux's Essay, an account is given of the same Giant by Dr. Musgrave (1698, No. 240, p. 184). This author gives a number of measurements of Malone, which had been communicated to him by Dr. Plot in a short note entitled, "An account of one Edmund Melloon, born at Port Leicester in Ireland, who was of an extraordinary size." The height of Malone is given in this Paper as seven feet six inches. The frontal bone to which Dr. Molyneux refers was preserved in the Medical School of Leyden, and from its great size he concluded that "he to whom this Bone belonged must have

property of Dr. Edward Barry), of whom figures and an ample account may be seen in the second volume of Dr. Charles Smith's Natural History of the County of Cork; a case so extremely rare and curious, that no other instance of the like has ever yet appeared; nor would the fact seem at all credible to posterity, was not the skeleton preserved as an unquestionable proof of this surprising phenomenon.*

"Our giant wanted but four inches of the height of a skeleton which was dug up in the place of a Roman camp, near St. Alban's by an urn, inscribed Marcus Antoninus, which, by the dimensions of the bones, was judged by the late celebrated anatomist, Mr. Cheselden, to be eight feet four inches high; and who published an account of it in the Philosophical Transactions, No. 333.† Goliath, mentioned in Samuel, chap. xvii., verse 4, was six cubits and a span, which, according to Bishop Cumberland, is somewhat above eleven feet English. Maximinius, the emperor, was nine feet high; and in the reign of Augustus, other persons are mentioned to have been as tall. On Monday a Lecture was read on the dissection of our tall Hibernian in the Anatomy House, before a numerous audience."

It is interesting to note that precisely the same article was also published in London in the *Annual Register* under the heading of Dublin, May, 20th.‡

It is very evident that this account of Magrath was not written by an ordinary reporter. At this period Professor Robert Robinson held the chair

been more than eleven or twelve foot high." Having come to this surprising conclusion, he well might add "a goodly stature, and such as may well deserve to be called gigantick." He was unable to trace the history of this frontal bone, and he goes on to say that this is really a matter of little importance, because, "it is sufficient to our present purpose, that we may from this Bone, as a fair *specimen,* together with other warrantable histories, clearly deduce, as I hope I have done, that there have been in Nature Humane Bodies eleven and twelve foot high; which equals, if not surpasses, the stature of the tallest giant mentioned in Holy Writ."

* This very remarkable skeleton still forms one of the most valuable specimens in the Pathological Museum of Trinity College.

† On looking up this Article by Cheselden, in the Philosophical Transactions (1710–12, No. 333, p. 436), I find that the measurements of several of the bones are given, viz. :—Circumference of the skull, 26 inches; left femur, 24 inches; right femur, 23 inches; tibia, 21 inches. Cheselden reckoned the height of this individual to have been eight feet (not eight feet four inches, as stated above). This great height is not warranted by the size of the bones. If we calculate from the length of the left femur we only get a height of seven feet two and three-quarter inches.

‡ "Annual Register; or, a View of the History of Politicks and Literature of the Year." London, May, 1760, p. 69.

of anatomy in the University of Dublin, and Dr. George Cleghorn was the University anatomist.* In all probability one or other of these gentlemen furnished the report to the three periodicals which we have quoted. In this belief I am supported by the valuable opinion of Professor Macalister, who is inclined to regard Dr. Cleghorn not only as the author of the article in question, but also as the prosector who prepared the dissection for the public demonstration which was given on the body by Professor Robinson.

But in addition to the above detailed account of Cornelius Magrath, I have been able to pick up from various sources some other items of information relating to him.

In the *Daily Advertiser*, published at that time in London, there are two references to Magrath. The first is in the form of a short notice, and the second is an advertisement. The former appeared in the issue of August 4th, 1752, and ran as follows:—

"Cork, *July* 24.—There is now in this city one Cornelius Magrath, a boy of 15 years 11 months old, of a most gigantic stature, being exactly 7 feet 9 inches three Quarters high, he is clumsy made, talks boyish and simple, he came hither from Youghal where he has been a Year going into Salt Water for Rheumatic Pains which almost crippled him, which the Physicians now say were growing Pains for he is grown to the monstrous Size he is of within these Twelve months. He was a month at the Bishop of Cloyn's who took great care of him; his Hand is as big as a middling Shoulder of Mutton, the Last of his Shoe which he carries about with him measures 15 Inches. He was born in the County of Tipperary, within five miles of the Silver Mines."

The same account was also published in the *London Magazine* of August, 1752.† It is clear that this article was the source from which several of the facts recorded in the report of Magrath's death were drawn.

The advertisement to which we have referred was issued after Magrath's arrival in London, and is somewhat amusing. It appeared in the *Daily Advertiser* (January, 1753). The following is a copy of it:—

"Just arrived in this City, from Ireland, the youth, mentioned lately in the newspapers, as the most extraordinary production in nature. He is allowed by the nobility

* *Vide* University Calendar.

† "The London Magazine; or, Gentleman's Monthly Intelligencer (The Monthly Chronologer)." August, 1752, p. 381.

and gentry, who daily resort to see him, to have the most stupendous and gigantic form (altho' a boy) and is the only representation in the world of the antient and magnificent giants of that Kingdom. He is seven feet three inches in height, without shoes. His wrist measures a quarter of a yard and one inch. He greatly surpasses Cajanus the Sweed in the just proportions of his limbs; and is the truest and best proportioned figure ever seen. He was 16 years of age the 10th of last March; and is to be seen at the Peacock, at Charing Cross, from eight in the morning till ten at night."

These two extracts from the *Daily Advertiser* do not in every respect harmonize with each other. In the one Magrath is referred to as "clumsy made"; in the other he is extolled for the just proportion of his limbs. I have not the least doubt that the former statement is the more accurate. As we shall see later on, the skeleton shows that Cornelius Magrath was not only "clumsy made" but that in some respects he was positively deformed. Then there is a discrepancy in regard to the height. In this both are inaccurate, although the advertisement is the more truthful of the two.

In the *Irish Penny Magazine* (1833) there is a short notice of Magrath. It repeats some of the incidents in his life to which we have already referred, and adds certain romantic episodes of his career which occurred during his residence in Florence. It is not necessary to narrate these, because it is very evident that they are merely imaginary embellishments added with the view of making the story more attractive. This is the only article in which Magrath's death is ascribed to a definite cause. It is stated that on his way from the Continent he arrived in Dublin at the time when the manager of the Theatre Royal was preparing a pantomime called the "Giant Queller." Magrath was induced to play the *rôle* of the giant, and while engaged in this part his foot slipped on a piece of orange peel, and he fell heavily on the stage. This accident was the direct cause of his death through the rupture of some internal organ. How far this story is true it is impossible to say. For my own part I am inclined to place no reliance on it. Still it is right to state that one of the common legends in College with regard to Magrath is that he died from the effects of a fall. In this story, however, the fall is said to have been produced by a student running unexpectedly between his legs.*

* Topinard, in his work on "Anthropology," states that Magrath died of phthisis. He does not mention where he acquired this information.

In 1756 Magrath's portrait was engraved in Germany by an engraver called Maag. I was aware of the existence of this engraving; indeed it is mentioned in Wood's book upon "Giants and Dwarfs," published in 1868; but I had certainly no hope of being able to secure a copy, and little hope even of obtaining a view of it, when it came most unexpectedly into my hands. Mr. J. Chaloner Smith, well known on account of his remarkable knowledge of engravings, having heard that I was interested in the history of Magrath, very kindly sent me the portrait in question, and, finally, in the most generous manner, presented it to Trinity College. I am glad to have this opportunity of cordially and gratefully acknowledging my obligations to him.

In this engraving Magrath is represented as being a well-built, well-proportioned, straight-limbed man. His features are pleasing and regular, and he is attired in the fashionable dress of the period. He stands with his left arm outstretched at right angles from his side, while below this a Prussian grenadier with a tall military hat on his head, and his musket shouldered, stands "at attention." The portrait cannot be considered as conveying any true idea of Magrath during life, because

the condition of his skull shows that he must have possessed a most repulsive face, while his limb bones indicate in the clearest manner that he was afflicted with the condition known as "knock-knee," and could not possibly extend his arm in the manner indicated in the drawing.

Below the engraving there is an interesting inscription in old German. The following is a copy :—

Ein Irrländischer Riss.

"Cornelius Magrat gebohren in Irrland den 10. Janu : a°. 1737, ist 19 Jahr alt, und besizet ein ungewöhnliche grösse und stärcke, also zwar das sich Europa durch seine Persohn einer Risengeburt diser Zeit rühmen kann, alldieweilen sein Armb ander hand 10½ Z. dick, und desen Mittelster finger so lang als eines aus gewachsenen Manns hand, sein gewicht ist 357 lb." *

In this inscription there are two points of interest, viz. the reference to the circumference of his wrist and his weight. It is important to note that the measurement which is here given for his wrist is almost the same as that given in the advertisement which appeared in the *London Advertiser* four years before.† In so far as his weight is concerned it must be borne in mind that four German pounds are equivalent to five English pounds. This makes Magrath's weight 446 English pounds, or 31 stones 12 lbs. I should imagine that this is not an over-statement. The enormous size of his chest and pelvis shows that his weight must have been in excess of what we might expect in a man of his stature.

I have little doubt that the print in question was prepared for advertising purposes, and that it was exposed in shop-windows and in other public places in the various towns which he visited in Germany.

I may mention, in passing, that during Magrath's lifetime there was in Ireland a very prevalent idea that his huge frame was to be regarded as the

* This may be translated as follows :—

"*An Irish Giant.*

"Cornelius Magrath, born in Ireland on the 10th January, 1737, is 19 years old, and possesses an uncommon stature and strength, so that Europe may boast of having produced, in this period, in his person, a true giant; considering that his wrist (arm at the hand) is 10½ in. thick, and that his middle finger is as long as the hand of a full-grown man; his weight is 357 lbs. (*i.e.* 446 lbs. English)."

† The German "Zoll" as nearly as possible equals the English inch.

successful result of an experiment by Bishop Berkeley in giant-rearing. In *Watkinson's Philosophical Survey of Ireland* we find the following amusing statement:—"The Bishop had a strong fancy to know whether it was not in the power of art to increase the human frame. An unhappy orphan appeared to him a fit subject for trial. He made his essay according to his preconceived theory, whatever it might be; and the consequence was that he (the orphan Magrath) became 7 ft. high in his 16th year." *

By the extreme courtesy of Signor D. Chilovi, Prefetto della R. Biblioteca Nazionale Centrale Firenze, I am enabled to give in full the following translation of the letter relating to Magrath which was written by the Italian physician Dr. Giovanni Bianchi† to one of his friends "concerning a giant who had passed through Florence." Signor Chilovi, in answer to a request from Count de Gubernatis, supplied a manuscript copy of this letter to Dr. E. P. Wright; and the following translation of it has been made for me by Mr. Henry Dixon:—

"On the evening of the 6th of the current month of July there came hither a giant, who was on view at a hostelry. I went to see him about midnight, and found that he was at table along with his companions eating, unsalted, some of the large fish called by the Latins *Asellus*, and by the Tuscans *Nasello*, and by us *Merluzzo*, and by the French *Molue*, and *Stockfish* in the Teutonic languages; and it is by the fishery for this fish that Cape Breton in America has become so famous in our times. The giant when sitting down was as tall as ordinary men standing; when he stood on his feet I had him measured with a cord, and found that he was 7 Parisian feet tall, *i. e.* 2 feet taller than the stature of ordinary men; and in consequence all used to pass under his arms when he held them parallel to the horizon. His hand, from the middle finger to the end of the palm, was 1 Parisian foot long, *i.e.* 5 inches (*dita*) longer than mine, which is not one of the smallest. His head, shoulders, and other parts were of a length and thickness proportioned to his immense body, which nevertheless had not greater strength than other men, nor proportioned to the size of his body and his limbs: nay, rather it was less, for he was constrained every now and then to sit down after he got up to show off his height, and the length of his arms, and of his other limbs; this shows that what Galileo says, towards the middle of his *Dialogo del Moto*, or perhaps of his *Scienze nuove*, is true, that nature cannot make giants who will have strength proportioned to the length of their limbs, unless it makes their limbs and bones by far thicker, or of a harder material, than ordinary (limbs and

* It is curious to note that Topinard seems to be inclined to give some credence to this tale.

† Novelle letterarie, pubblicate in Firenze l'anno MDCCLVII. Tomo 18, column 492.

bones); because when they are proportioned as ordinary (limbs) they become weak of themselves. I believe that if this giant will continue to grow, as it seems he will—for he says that since he set out from Ireland, *i. e.* from the city of Cork, his native country, within the space of a year that he has grown 8 Parisian inches (*digiti*)—that he will be compelled to remain always lying down, or at least sitting. He now says that he is 20½ years old, and he does not seem to be more to judge by his face and reasoning powers. As for me I believe that this growth which goes on so immoderately in his body is a malady, because he says that he is the son of parents who are of an ordinary stature, and that up to the age of 11 he was of ordinary height; but that afterwards he commenced to grow in this immoderate manner: and probably he will continue to grow as long as he lives or as long as this malady sticks to him, which does not confer on him greater strength in his limbs, nor larger appetite; nay, he has less strength as I observed; and likewise he has also less appetite. This last might also arise from the manner in which his conductors treat him, keeping him too much confined in these hot climates, since they should sometimes take him for a walk, especially by the sea, all the more because he was born in a maritime and cold country; but the desire for greater gain will perhaps cause them to lose all. His name is Cornelio Malcgraf (*sic*). He says he is a Roman Catholic; but one of his keepers is a Jew, as one of the same nation, who has conversed with this keeper, told me. Farewell.—Rimino, *July* 12, 1757."

For many years the skeleton of Cornelius Magrath was preserved in the Museum of the Medical School in Trinity College, but about 1879 it was transferred to the Anatomical and Zoological Museum. Lastly, a few months ago, it was placed in that section of the building which has recently been set aside for the reception of the Anthropological collection, and it has consequently come into my hands.

There is evidence of two kinds of handiwork having been employed on the skeleton of Cornelius Magrath. In the original articulation nothing could be finer than the workmanship displayed. To Dr. Cleghorn, no doubt, the credit is due of having superintended this work, because Dr. Robinson who held the chair of anatomy at the time of Magrath's death was superseded in the following year by the University anatomist. Unfortunately, at a period long after this (I am not able to fix the date), Magrath fell into bad hands. Some Museum assistant at this time seems to have taken the skeleton partially asunder, and subjected it to shocking usage. To hide his treatment of it, or, it may have been with the view, according to his opinion, of more effectually preserving the bones, he gave it a coat of paint,

and then followed this up with several coats of varnish. So thick was this covering that it completely concealed the essential features of the skeleton. For several weeks we were engaged in removing this coating, and at last we have got the skeleton fairly clean. During the process some not very creditable disclosures were made. It would appear that in the second articulation many of the smaller bones were lost, and for these others had been substituted from other skeletons in the most reckless and ignorant manner. I may give a few examples :—1. The thumb of the left hand was found to be composed of the following bones : (*a*), the metatarsal bone of the foot of another individual, elongated with gutta-percha, which stood for the metacarpal bone ; (*b*), the metacarpal bone of the thumb of another individual which stood for the proximal phalanx ; (*c*), the terminal phalanx of the great toe of another individual which stood for the ungual phalanx. 2. When the paint and varnish were removed from the left patella it was found to consist of the lower fragment of the original bone with a scaphoid bone from the foot of another individual joined together and moulded into shape by means of gutta-percha. 3. The gladiolus and ensiform cartilage were placed so that the anterior surface looked backwards into the chest. 4. The acromion process of the left scapula which had at some time or other been broken off was replaced by the corresponding acromion of another bone joined to the spine by means of gutta-percha. This is all bad enough, but I regret to say that in some cases there is evidence that the ends of certain of the long bones (radius and clavicle) were deliberately sawn off to facilitate articulation.* I need not say that as far as possible all foreign matter has been removed, and the deficient bones have been modelled in wood from those of the opposite side. It is but right to state that this work has been done by my assistant, Mr. John Stirling, and I wish here in the most cordial manner to acknowledge the care and skill with which he has effected the restoration of the skeleton.

Through the courtesy of Professor Stewart, the Curator of the Museum

* I mention these facts most unwillingly, but I consider that it is necessary to do so, and for the following reason :—It will be known in after years that we worked at this skeleton, but unless we put on record the state in which we found the bones, we might very naturally get the credit of some of the barbarisms which I have mentioned.

of the Royal College of Surgeons in England, I have had the opportunity of studying the skeleton of Charles Byrne, the Irish giant, who died in London, at the early age of 22, in 1783, and whose body was obtained by John Hunter. A short account of the life of this giant is given in the Catalogue of the Museum.* In some respects the skeleton of Byrne presents a strong resemblance to that of Magrath. It differs, however, in being better proportioned, and in the absence of marked deformities. Still, in many of its parts it is not symmetrical, and in some respects it might almost be considered to exhibit features which would seem to indicate the presence of incipient acromegaly. The study of this skeleton has proved most instructive, and as I proceed with the description of the several bones of Magrath, I shall introduce, for purposes of comparison, the measurements which I made on the London skeleton.

Height of Magrath.

At the time of his death Magrath had attained the age of 23. With the exception of the upper end of the humerus and the lower end of the radius, all the epiphyses were united. He may, therefore, be considered to have reached his full stature. The statements which have been made regarding his height are most conflicting. From information supplied to him from Ireland, Professor Sir George Humphry† gives the height as 8 ft. 6 in., and it is, therefore, not surprising that in the list of giants quoted by this author, Magrath stands pre-eminent.‡ In the article published in *Faulkner's Journal*, *Pue's Occurrences*, and the *Annual Register*, which we have quoted in full, we are told that during life Magrath

* Descriptive Catalogue of the Osteological Series, contained in the Museum of the Royal College of Surgeons of England, vol. ii. Mammalia Placentalia. London, 1853. No. 5905. Hunterian, p. 913. Catalogue of the Specimens illustrating the Osteology and Dentition of Vertebrated Animals contained in the Museum of the Royal College of Surgeons of England, by William Henry Flower. Part I. Man. No. 223, p. 24.

† "Treatise on the Human Skeleton," 1858, p. 109.

‡ Humphry's measurements of Magrath have been accepted by almost all the Continental authorities, and many inferences have been drawn from them by those authors who have dealt with the question of giant-growth.

measured 7 ft. 8 in., while Wood, in his work on Giants and Dwarfs, states that the height of the skeleton is 7 ft. 9 in.

Topinard gives Magrath's height as 2230 m.m., or 7 ft. $3\frac{3}{4}$ in.; whilst Dr. Bianchi, who measured him during life, gives the height as 7 Parisian feet. The Parisian foot is equal to 12·78 inches, so that by English measurement we obtain a height of 7 ft. 5 in.

All of these statements are inaccurate. The skeleton is only 7 ft. $2\frac{1}{4}$ in. high. But there is a difficulty in arriving at a correct estimate of Magrath's height from the skeleton, for three reasons: (1) the articulator has been very liberal in his supply of intervertebral substance; (2) the left lower limb is somewhat longer then the right; (3) the lower limbs are deformed, and show a marked degree of "knock-knee." Under these circumstances, it is necessary to test the question of height by other means. From calculations furnished by Professor Sir George Humphry, it has been customary to consider the femur to stand in relation to the height of the individual in the proportion of 275 : 1000.* More recently, however, Topinard has shown that this method for the restitution of the stature is defective in so far as it pre-supposes a unity of proportions in individuals of very different heights. "The limbs, and each of the long bones which represent them, are longer in tall individuals, and shorter in small individuals. This proposition is above all true in the case of the lower limbs." Topinard, therefore, groups individuals into three classes according to their stature, and gives a formula for each. The following is the table which he gives:—

	Length of Femur.
22 men of high stature (173 and upwards), . . .	27·7
29 men of medium stature, ...	26·7
21 men of short stature (140 and under), . . .	27·2†

Upon this principle, then, it will be necessary in the case of Magrath to consider the femur as presenting a proportion to the stature of 277 : 1000. But here we are met by another difficulty, because the left femur is 21 m.m. longer than the right, and the question arises which shall we select for the purpose of calculating the stature? If we take the right

* "Human Skeleton," 1858. Table iv., p. 108.

† "Revue d'Anthropologie." 15 Janvier, 1885, p. 138.

femur the height is 2176·9, or 7 ft. $1\frac{5}{8}$ in.; if we make the choice of the left femur the height becomes 2252·3, or 7 ft. $4\frac{5}{8}$ in. I am inclined to believe that the height afforded by the right bone (viz. 7 ft. $1\frac{5}{8}$ in.) is the more accurate of the two. The greater length of the left bone is largely if not entirely due to deformity. In the left limb the condition of "knock-knee" is much more marked than in the right, and in connexion with this the internal condyle of the femur is more elongated, and the neck is longer and joins the shaft at a more obtuse angle. These are the conditions which are chiefly responsible for giving this bone a greater length, and such being the case, I do not believe that we would be justified even in striking a mean between the two femora. I consider that the more accurate estimate is to be obtained from the right femur alone.

Magrath was undoubtedly of smaller stature than Charles Byrne. In the catalogue referred to the height of Byrne's skeleton is given as 2310, or 7 ft. 7 in. I have tested this measurement, and found it to be absolutely correct. But in this skeleton also the articulator has been very liberal with his supply of intervertebral substance. This is more especially noticeable in the dorsal region. It would be well, therefore, to test the measurement by calculating the height from the femur. In this skeleton also we meet with the same difficulty that confronted us in the case of Magrath. The left lower limb is longer than the right, and this is almost entirely due to a difference in the length of the two femora. The right femur measures 625 m.m., while the left is 642 m.m. In this case, however, there is no deformity of the internal condyle in either bone, although the neck of the left thigh bone is distinctly longer than that of the right. If we take the right femur as our standard the height is 2256·3, or 7 ft. $4\frac{3}{4}$ in., but if we select the left femur the height rises to 2317·7, or 7 ft. $7\frac{1}{4}$ in. I should imagine that the mean between these two results would in this case give us the most accurate estimate. We may consider, therefore, Byrne's height to be 7 ft. 6 in.

There have been many giants taller than Magrath, and several taller than Byrne. The following list cannot be considered to be, by any means a complete one, but it gives those of whom we have got the most authentic and reliable information :—

GIANTS OVER 7 FEET IN HEIGHT.

Authority.	Name and Country of Giant.	Height in m.m.	Height in feet and inches.
TOPINARD,[1] . .	*An Austrian*—(de l'Expos. Sc. Anth. de Paris),	2550	8 feet $4\frac{1}{4}$ inches.
	A Kalmuck—(in the Orfila Museum, Paris), .	2530	8 feet $3\frac{1}{2}$ inches.
	A Swedish Guard of Frederick II., . . .	2520	8 feet $3\frac{1}{8}$ inches.
RANKE[2] . . .	*Marianne Wehde*[3] (of Benkendorf, near Halle),	2550	8 feet $4\frac{1}{4}$ inches.
	Chang[4] (the Chinese Giant),	2360	7 feet $8\frac{3}{4}$ inches.
	Drasal[5] (from the neighbourhood of Olmütz),	2300	7 feet $6\frac{1}{2}$ inches.
	Thomas Hasler[6] (of Bavaria), . . .	2270	7 feet $5\frac{1}{4}$ inches.

[1] Eléments d'Anthropologie générale. Paris, 1885, p. 436.

[2] Der Mensch. Leipzig. 1887, vol. ii. p. 133.

[3] Marianne Wehde was $16\frac{1}{2}$ years of age when measured. Ranke reproduces in his book a photograph in which she is represented as standing beside a man of medium height. The top of his head reaches only a short distance above her waist-band.

[4] Chang-Yu-Sing, the Chinese Giant, was over 30 years old, and weighed 368 lbs. (Ranke).

[5] The giant Drasal was 37 years old when measured by Bollinger (Ranke).

[6] Thomas Hasler showed a perfectly normal growth up to his ninth year; he then began to grow to an enormous extent. At 11 years old he was so big that the benches at the school were not of sufficient size to hold him; at 12 years old he measured 6 feet. Gradually the skull and face bones became thickened, the colour of his skin was pale, every movement fatigued him and gave him pain; now and then there was headache. He died when 25 years old. The vertebral column was abnormally curved. Some of these symptoms are suggestive of acromegaly.

Giants over 7 feet in Height.

Authority.	Name and Country of Giant.	Height in m.m.	Height in feet and inches.
Virchow,[7] . .	*Winkelmeier*[8] — (born in Mattikhofen, Upper Austria), . . .	2278	7 feet $5\frac{5}{8}$ inches.
	Murphy[9] (an Irish giant), .	2220	7 feet $3\frac{3}{8}$ inches.
Langer,[10] . . .	*Lolly*,[11] a Pomeranian giant (skeleton preserved in the Anatomical Museum of St Petersburg), .	2195	7 feet $2\frac{3}{8}$ inches,
	Innsbruck Giant[12]—skeleton preserved in the Innsbruck Museum),	2226	7 feet $3\frac{5}{8}$ inches.
	Cajanus[13]—a Finn—whose femur is preserved in the Leyden Museum),	2220	7 feet $3\frac{3}{8}$ inches.

[7] Zeitschrift für Ethnologie. Siebenzehnter Band. 1885, p. 469.

[8] Winkelmeier was 20 years old when measured by Virchow. He was well built, but had a pimply face and somewhat weak muscles. It was only at the time of puberty that the unusual degree of growth began. In his family there is no one of a similar great stature known to him.

[9] Langer gives Murphy's height as 2280 m.m. or 7 ft. $5\frac{5}{8}$ in. As Virchow conducted the measurements himself I am inclined to believe that his figures are the more accurate. I am informed by the Rev. Canon Murphy that the skeleton of this Irish giant is preserved in the Marseilles Museum.

[10] Wachsthum des menschlichen Skeletes mit Bezug auf den Riesen. Denkschriften der kaiserlichen Akademie der Wissenschaften, Wien (Math. Natur. Klasse). Band xxxi. 1872, p. 91.

[11] Lolly died in St. Petersburg in 1816. He was afflicted with *genu valgum* of the right lower limb.

[12] The Innsbruck skeleton was found on the rebuilding of the Crypt of the Cathedral. It is not complete; the hands, feet, and several other bones are wanting. "Existing historical notices, and the comparison of the skeleton with a life-sized portrait preserved in the Collection of the Castle Ambras in Innsbruck, leave scarcely any doubt that the remains are those of the well-known armour-bearer of Archduke Ferdinand of Tyrol, the founder of the celebrated Ambras Collection, where also the armour of this giant is preserved." Langer reproduces the portrait of this giant in his memoir.

[13] Cajanus is referred to in certain of the contemporaneous notices which were published of Magrath. In one of these his height is given as 7 ft. 8 in. (*vide* page 557). He died in 1749. Topinard gives his height as 2830 m.m. or 9 ft. $3\frac{3}{8}$ in. This is certainly incorrect, as his femur preserved in Leyden only measures 615 m.m. (Langer). The height given in the list has been calculated from this.

To the above list might have been added the skeleton of a giant preserved in the Berlin Museum (Catalogue No. 3040). It measures 2200 m.m. or 7 ft. $2\frac{1}{2}$ in.; he was one of the famous Guards of Frederick II. (Langer).

When I refer to any of the above-mentioned giants in the succeeding pages, it will be understood that I am merely quoting facts which are supplied by the authors named in the list.

The General Characters Presented by the Bones.

The special characters presented by the different bones in Magrath's skeleton will be dealt with in the detailed description which we purpose giving of each. At the same time there are certain general features which can be seen in every part of the skeleton. Thus there are everywhere present appearances which indicate that during life the different bones had a high degree of vascularity. The Haversian canals are dilated, and the mouths of these filled with foreign matter give to the surface a punctated or dotted appearance. In the shafts of the long bones also the medullary or nutrient canals have undergone a remarkable degree of expansion. Fritsche and Klebs* have called attention to the fact that in acromegaly the blood vessels are expanded.

Again, at the articular ends of the bones, and in all other places where cancellous tissue is present in bulk, as in the vertebræ, basi-occipital, bones of the foot, &c., the surface of the bones are highly irregular. The vascular canals are large and conspicuous, and osteophytic growths in the form of warty or jagged prominences are present. These are clearly of an arthritic character. But the inflammatory process is not confined to the articular ends of the long bones. It seems to have spread from these on to the shafts along the lines of fibrous attachment. Thus, the more evident impressions for the attachment of muscles and ligaments exhibit that peculiar roughness and bony deposit which we know results from periostitis. This is particularly noticeable in the anterior intertrochanteric ridges of the femora, the deltoid impressions of the humeri, the popliteal surfaces of the tibiæ, &c., whilst obscure patches of the same condition are even to be seen on the exterior of the vault of the cranium. The scoring

* "Ein Beiträg zur Pathologie des Riesenwuchses." Leipzig, 1844.

or grooving in the shafts of the long bones so characteristic of periostitis is also apparent.

In these general characters the skeleton of Magrath is very similar to the acromegalic skeleton in Edinburgh, and bears out a statement which is made by Dr. Thomson* in regard to it, viz.:—

"The skeleton in acromegaly shows an approach to the changes met with in osteo-arthritis, and in a minor degree to those occurring in osteitis deformans."

In connexion with the pelvis and the femora we shall also have to discuss certain appearances which might perhaps be considered to indicate that Magrath at an early period in his life was afflicted with rickets.

The Skull.

When we regard the skull of Magrath in its place on the summit of the vertebral column, it appears small in comparison with the remainder of the skeleton. In people of gigantic stature it is unusual for the head to grow in proportion to the other parts of the body. In Magrath, however, the appearance is somewhat deceptive; the great expansion of the thorax causes the skull to look smaller than it is in reality.

Langer† has noticed that the head in giants is, as a rule, relatively small. He says, at p. 98:—

"Alle Riesen haben mindestens relativ kleine Köpfe und um so kleinere, je höher sie sind. Nur ausnahmsweise erreicht der Schädelinnenraum ein das gewöhnliche Mittelmaass überschreitendes Kaliber."

Virchow‡ doubts the accuracy of this statement. He considers that not only the horizontal circumference but also the diameters of the cranium

* Journ. Anat. and Phys., vol. xxiv., p. 490.

† "Wachsthum des menschlichen Skeletes," &c.—Denksch. der Kais. Akad. (Math. Natur. Klasse.) Wien, 1872.

‡ Zeitschrift für Ethnologie, 1885, p. 470.

in giants exceed the average. He is of opinion, however, that the basis cranii is relatively short.

In order that we may form a proper judgment on the proportions of the several parts of Magrath's skull, it is necessary that we should, in the first instance, make ourselves acquainted with those in the typical Irish skull. For this purpose I have measured seven male Irish crania, taken at random from the Trinity College collection. The averages obtained from these will serve as a basis of comparison. In making the measurements I have followed closely the methods recommended by Sir William Turner.* In two particulars, however, I have deviated slightly from these :—

(1) In gauging the cubic capacity of the cranium I was not able to follow Sir William Turner's plan, although I am satisfied that where it is possible to do so it would yield the most accurate results. Some of the skulls which I measured were fragile, and I was averse to subject them to the strain which is produced when the cranium full of heavy shot is tilted suddenly forward and backward. To ensure the uniform distribution of the shot within the cranial cavity, I employed the sharp end of Broca's rammer, and in doing so I subjected the shot to as little pressure as possible.

(2) In estimating the facial index, Broca compares the ophryo-alveolar length with the bi-zygomatic diameter. Sir William Turner reluctantly employs this index, although he urges some very valid reasons against its use. The ophryon is a point which it is exceedingly difficult to determine with precision in different skulls; I have been induced, therefore, in this Memoir, where the face-index is a matter of so great importance, to adopt a different method. I have calculated the facial index by comparing the bi-zygomatic diameter which we take as the standard, and equal to 100 with the *naso-alveolar length.*

In the following Table I have introduced not only the measurements I have obtained from the skulls of Magrath, Byrne, and the seven Irish

* Report on the Human Skeletons.—The Crania. The Zoology of the Voyage of H.M.S. Challenger. Part XXIX.

crania, but also those of the Edinburgh acromegalic skull. The latter I have obtained from the admirable Paper of Dr. Alexis Thomson:—

Table I.

Skull Measurements and Indices.

	Cornelius Magrath.	Charles Byrne.	Edinburgh Acromegalic Skull.	Average of Seven Irish Skulls.
Cubic capacity,	1600	1520	1580	1526
Glabello-occipital length,	198	215	200	189
Basi-bregmatic height,	139	148	142	137
Vertical Index,	**70·2**	**68·8**	**71**	**72·4**
Minimum frontal diameter,	109	111	101	94·4
Stephanic diameter,	136	125	129	121·5
Asterionic diameter,	144	128	115	111·5
Maximum breadth,	155	151	148	143
Cephalic Index,	**78·3**	**70·2**	**74**	**75·7**
Horizontal circumference,	568	593	561	526
Frontal longitudinal arc,	139	150	147	128·2
Parietal do.	135	130	138	129·6
Occipital do.	120	128	133	119·3
Total,	394	408	418	377
Vertical transverse arc,	340	330	333	307·3
Length of foramen magnum,	40	43	33	36·7
Basi-nasal length,	105	122	106	103
Basi-alveolar length,	107	115	105	98·6
Gnathic Index,	**101·9**	**94·2**	**99·1**	**95·6**
Inter-zygomatic breadth,	156	148	150	131
Intermalar breadth,	127	126	126	111·1
Naso-alveolar length,	96	82	81	73·4
Facial Index,	**61·5**	**55·4**	**54**	**55·7**
Nasal height,	72	62	59	53·7
Nasal width,	29	29	24	24
Nasal Index,	**40·2**	**46·7**	**40·7**	**44·4**
Orbital width,	44	42	45	41
Orbital height,	43	34	36	35·1
Orbital Index,	**97·7**	**81**	**80**	**85·3**
Palato-maxillary length,	50	61	67	53·3
Palato-maxillary breadth,	65	62	70	60·3
Palato-Maxillary Index,	**130**	**101·6**	**104·4**	**113·2**

Facial part of the Skull.—The first point which strikes one in looking at the skull of Magrath is the disproportion which exists between the size of the cranium and that of the face. The cranium is, if anything, small for a person of his gigantic stature; the face is out of proportion both to

the cranium and the stature. The increase in the size of the face is due to a downward growth of the maxillary bones, together with a great enlargement of the lower jaw.

The growth of the maxillary bones is accompanied by a great expansion of the enclosed air-sinuses. This expansion, however, has taken place only in the vertical direction. By drawing the first molar tooth on the right side, I was able to sound the depth of the corresponding antrum; it was no less than 55 m.m. deep. But the increase in the vertical length of the maxillary bones is not limited to the bodies. The alveolar processes are greatly elongated, so as to produce a palatal vault of extraordinary depth. It is interesting to note also that the nasal processes of these bones have undergone a corresponding growth.

On looking at the facial part of the skull from behind, its elongation becomes even more evident. The pterygoid processes which support the face in its lower part are long and strong, but they fall far short of the maxillary tuberosities. The latter project to the extent of half an inch beyond the extremities of the pterygoid processes. A similar condition constitutes a striking feature of the Edinburgh skull.

The exaggerated growth of the maxillary part of the face is entirely confined to an elongation in the vertical direction. There is no growth forwards, nor any increase in width.

The vertical depth of the face, measured from the nasion to the chin, in the different skulls under consideration, was as follows :—

Table II.

Vertical depth of Face (from nasion to chin), compared with stature.
Stature = 100.

Length of Face.		Stature.	Face Stature Index.
Magrath, ...	156 m.m.	2177	7·16
Winkelmeier, . . .	149 m.m.	2278	6·54
Edinburgh acromegalic skull,	148 m.m.	1830	8·08
Murphy, ...	143 m.m.	2220	6·44
Byrne, ...	137 m.m.	2287	5·99
Seven Irish skulls (average),	120 m.m.	1710	7·01

When we recollect that of the four giants mentioned in the above list, Magrath is the shortest, the excessive elongation of his face becomes very manifest. Further, it is curious to note that Byrne, the tallest of the series, has the shortest face.

By comparing the total face-length with the stature we obtain some curious results. If we assume the stature to be equal to 100, the average Irish face is 7·01. In only two of the skulls under consideration, viz. Magrath and the Edinburgh skull, is this proportion exceeded. In the three remaining giants the face is short in comparison with the stature. This is particularly the case in Byrne.

If we now exclude the lower jaw from the measurement, we find the naso-alveolar length to be as follows:—

Table III.

Naso-alveolar length compared with stature. Stature = 100.

	Naso-alveolar length.	Stature.	Naso-alveolar Stature Index.
Magrath, ...	96	2177	4·40
Byrne, ...	82	2287	3·58
Edinburgh skull, ...	81	1830	4·42
Average of seven Irish skulls,	73	1710	4·26

Tested in this way we see that the maxillary part of the face, both in Magrath and the Edinburgh skull, is not only absolutely, but also, as compared with the stature, relatively longer than the average obtained for the seven Irish skulls. In Byrne, however, the naso-alveolar length, in relation to the stature, is very short.

We must next endeavour to ascertain the proportions which exist between the facial and cranial portions of the skulls in question. The absolute measurements furnish us with a very inadequate idea of these. Indeed, it is a difficult matter to arrive at a proper means of determining this point. We cannot compare the length of the face with that of the cranium, because the shape of the latter affects its antero-posterior diameter without necessarily diminishing its size. After some consideration, I have come to the conclusion that our present purpose would be served if we took

the circumference of the cranium as our standard and equal to 100, and compared the facial length with this. This, no doubt, is a rough way of arriving at the relative increase of the face in the skulls in question, and not altogether an accurate one, because no account is taken of the height of the cranium. Further, in acromegaly, the cranium is also supposed to be enlarged, although not to the same extent as the face. Tested by this means I find that the relative length of the face, *inclusive of the lower jaw*, as compared with the cranium, is as follows:—

Table IV.

Length of the face from nasion to chin, compared with the size of the cranium. Circumference of cranium = 100.

Magrath,	27·4
Edinburgh skull,	26·3
Winkelmeier,	24·2
Murphy,	22·3
Byrne,	23·1
Seven Irish skulls (average),	22·8

The great elongation of the face in relation to the cranium, both in Magrath and the Edinburgh skull, is, by this means, rendered very apparent. In Winkelmeier the face is also, to a small extent, out of proportion with the cranium. In the case of Murphy and Byrne, however, the relation of face to cranium approaches very closely to the standard we have obtained by the measurement of the seven Irish skulls.

Let us next exclude the lower jaw and compare the naso-alveolar length with the horizontal circumference of the cranium.

Table V.

Naso-alveolar length compared with the size of the cranium. Circumference of cranium = 100.

Magrath,	16·8
Edinburgh skull,	14·4
Byrne,	13·8
Seven Irish skulls (average),	13·8

These indices show that in Magrath and, to a less extent, in the

Edinburgh skull, the excess of growth is present, not only in the mandibular, but also in the maxillary part of the face. In Byrne's skull it is apparent that the maxillary portion of the face is not unduly elongated.

We must next endeavour to make out the precise relative proportions of the maxillary and mandibular parts of the face. In all the skulls under consideration, the alveolar portions of the jaws are complete, and have undergone no absorption. The measurements required for this purpose can, therefore, be accurately obtained. The two measurements which we must compare are the naso-alveolar length, and the symphysial height of the lower jaw; let us take the former as our standard, and equal to 100. The following are the indices obtained:—

Table VI.

Relation of Maxillary to Mandibular portions of the face—Symphysial height = 100.

The Edinburgh skull,	56·4
Byrne,	50
Magrath,	47·9
Seven Irish skulls,	46·5

In all three the depth of the lower jaw is distinctly greater than normal. This is particularly noticeable in the Edinburgh acromegalic skull and in Byrne.

The *facial index*, obtained by comparing the naso-alveolar length with the bi-zygomatic diameter, is, in the present case, very instructive. As will be seen in Table I., p. 574, these indices are the following:—

Magrath,	61·5
Byrne,	55·4
Edinburgh skull,	54
Seven Irish skulls,	55·7

From these we gather that not only is the naso-alveolar part of Byrne's skull of proper length, but also it is of proper breadth. The Edinburgh

skull, as we have noted, presents an increased naso-alveolar length, and this being established, the *facial index* of 54 shows that it is also somewhat enlarged in the transverse direction. Magrath's facial index is remarkable, and points to a great elongation of face, with little or no increase in the transverse width.

In Magrath's skull, as we might expect from the marked elongation of the maxillary part of the face, the nasal cavities present a great vertical depth. This is well brought out by the *nasal index.* In calculating this index the distance from the nasion to the sub-nasal point is taken as the standard, and equal to 100; with this is compared the maximum width of the anterior narial aperture. A low index, therefore, may be held in the skulls under consideration to indicate an increased depth of the nasal chambers. The nasal indices obtained are as follows:—

Magrath, ...	40·2
Edinburgh skull, . . .	40·7
Byrne, ...	46·7
Seven Irish skulls, . . .	44·4

Here again the Edinburgh skull and Magrath's skull are brought into association by the low nasal index which has been obtained for each.

As will be seen in the front view which is given of Magrath's skull, in Plate VIII. (fig. 1), the anterior aperture of the nose is not symmetrical. The left side is shorter and wider than the right side. This is not an uncommon occurrence even in skulls which are otherwise well formed. During life it is associated with a deflection of the cartilaginous part of the nose, towards the wider side of the narial aperture.*

The posterior nares are also unsymmetrical. They are very long and narrow, and the right opening is somewhat deeper than the left.

The orbits are in many respects remarkable. They are shallow, but at the same time extremely capacious, and the most striking character is the great length of the vertical diameter of their bases. This is shown by an exceedingly high *orbital index.* In the construction of this index the

* H. Welcker, "Die Asymmetrien der Nase und des Nasenskeletes." Stuttgart, 1882.

transverse diameter is taken as the standard and equal to 100. Let us compare the orbital index of Magrath's skull with those obtained from the other skulls in question:—

Magrath,	97·7
Byrne,	81
Edinburgh skull,	80
Seven Irish skulls,	85·3

In the Edinburgh acromegalic skull and in Byrne's skull the reverse condition is present. There is a disproportionate width of the base of the orbit. The great vertical depth of the orbital opening in Magrath must be associated with the marked elongation of the maxillary part of the face.

Looking into the orbital cavities of Magrath's skull it is seen that the left sphenoidal fissure has undergone a great expansion. This is more marked in its inner wider part. Here it is no less than 11·5 m.m. in width, and at least twice as wide as the corresponding part of the left sphenoidal fissure. We shall have to refer to this again when we come to describe the interior of the cranial cavity.

We have already referred to the great depth of the alveolar portions of the maxillary bones. The arch which they form for the reception of the teeth is in other respects small. Indeed, when it is compared with the alveolar arch of an ordinary skull, it is seen to exceed it very little in point of span. But a further peculiarity is that the palate, with the surrounding dentary arcade, is extremely short. This is brought out by the *palato-maxillary index*:—

Magrath,	130
Byrne,	101·6
Edinburgh skull,	104·4
Seven Irish skulls,	113·2

By means of these indices we ascertain that whilst in the case of Magrath the palato-alveolar part of the face is disproportionately short, it is on the other hand somewhat longer than usual in both Byrne and the Edinburgh skull.

Although Magrath was only 23 years old when he died, he possessed the full complement of teeth in the upper jaw. Unfortunately the front teeth have been lost and replaced by others from an extraneous source. The

three molars and the second bicuspid on the right side are the only teeth which I am satisfied originally belonged to Magrath. In conformity with the short antero-posterior length of the alveolar process the molars are very small and stunted. The first molar has three fangs, but these are crushed together, and the palatal and the postero-external are more or less fused along their whole length, and occupy one socket. In the second molar and in the wisdom-tooth the fangs are completely amalgamated, and form in each case a conical root.

In a skull such as that of Magrath the *gnathic index* proposed by Flower does not give a proper estimate of the degree of maxillary projection. The great elongation of the face unduly increases the basi-alveolar length which is taken as the standard of comparison and gives a false result. Thus judged by this index we would require to place Magrath in the meso-gnathic class (the gnathic index being 101·9), whereas he is distinctly orthognathous. The eye alone is able to determine this.

Of all the bones of the face the mandible is the one which is most characteristic of acromegaly. In Magrath it is of enormous size, being increased in all directions except in the antero-posterior width of its ascending ramus. The base is exceedingly strong and the chin extremely prominent. But the growth is not confined to its basal part. The alveolar portion has also increased in height, whilst the dentary arcade has widened out to such an extent that the incisors of the lower range are placed fully half an inch in front of the corresponding teeth of the maxillary arcade. Indeed the lower molars are the only teeth of this range that are in apposition with the teeth of the maxillæ. On the left side even this apposition is of a very imperfect kind, as the greater portions of the crowns of the lower molars lie to the outer side of the upper molars. On the right side it is more perfect. Here the inner tubercles of the lower molars fit into the intervals between the outer and inner tubercles of the upper teeth. But the order of apposition is reversed. Thus the upper wisdom-tooth is quite unopposed. The wisdom-tooth of the lower jaw is in contact with the second molar of the upper jaw; the second lower molar is opposed by the first upper molar, whilst the first lower molar is in very partial apposition with the upper bicuspids.

The full complement of teeth is present in the mandible of Magrath, and these with the exception of one (viz. the left lateral incisor) appear to me to be the original teeth. They are small in comparison with the bone in which they are implanted.

As the body of the mandible is traced backwards towards the ramus it gradually diminishes in vertical depth until at the point where it joins the ramus it has become, comparatively speaking, slender. Here its depth is only 32 m.m. as compared with 46 m.m. at the symphysis.

The ramus is exceedingly long and narrow. The coronoid and condyloid processes which surmount it are consequently placed close together. They are of considerable height, but their strength is not proportionate to the size of the massive body. The coronoid process rises higher than the condyloid process.

The body meets the ramus of the mandible at an angle of 127°. This is not very different from the angle in a typical lower jaw. It is slightly more open, the average adult angle being about 120°.

The following are the dimensions of the mandible in the series of skulls we have under consideration:—

Table VII.

Dimensions of Mandible.

	Magrath.	Byrne.	Edinburgh Acromegalic Skull.	Average of Three Irish Mandibles.
Symphysial height, . .	46	41	46	34
Coronoid height, . .	98	102	96	67
Condyloid height, . .	95	92	90	70
Gonio-mental length, .	113	110	103	95
Gonio-alveolar length, .	104	97	—	91
Intergonial width, . .	113	118	101	100
Breadth of ascending ramus,	34	35	36	33

The mandible of Magrath presents a striking resemblance to that of the Edinburgh acromegalic skull. An examination of the above Table will show

that in both cases the dimensions are very similar. In Magrath, however, there is a greater antero-posterior length of the body and a greater intergonial width.

In Byrne the only acromegalic feature of the face is the mandible, but in many respects it is different from the lower jaw of Magrath. It presents the same excessive symphysial depth, the same enormous development of the basal portion of the body and the same striking projection of the chin; but it differs in so far that the alveolar arch is not carried forward nor markedly widened. This latter feature is shown by comparing the gonio-mental and the gonio-alveolar length in the two cases:—

	Magrath.	Byrne.
Gonio-alveolar length,	104	97
Gonio-mental length,	113	110

The two mandibles, therefore, are modelled upon somewhat different lines, and of the two the lower jaw of Magrath presents the closest approximation to what we may regard as the typical shape.

In Byrne's mandible all the teeth are present with the exception of the left wisdom-tooth. The lower incisors when the mouth is closed lie behind the corresponding teeth of the maxillary bones. Behind this on the right side the upper and lower teeth fit accurately and in the usual way, but on the left side the lower molars are not in proper apposition with the corresponding teeth of the upper range. They are placed further out than they should be.

In the Edinburgh skull the front teeth of the lower range do not lie behind the corresponding teeth of the upper range when the mouth is closed. They are carried forward so as to strike accurately against the corresponding upper teeth. By this the total length of the face is increased.

In each of the three mandibles under consideration the narrowness of the ascending ramus is striking. It varies from 34 m.m. to 36 m.m. In the typical bone the width is just about the same, viz. 33 m.m.

Arnold* inclines to the opinion that the length-increase of the mandible

* "Acromegalie, Pachyacrie oder Ostitis?" Beiträge zur pathologischen Anatomie und zur allgemeinen Pathologie. Zehnter Band, erstes Heft. Jena, 1891.

in cases of acromegaly is not due to an inherent growth energy, and he seems to endorse the view of Brigidi*, that the changes in the facial bones are dependent upon an increase in the size of the tongue.

Fritsche and Klebs entertain a similar opinion. Thus they remark :—"Es wirft dieses Verhältniss ein helles Licht auf das Zustandekommen der eigenthümlichen Deformität des Unterkiefers, dessen gesteigertes Wachstum zwar auf allgemeinen, den ganzen Knochen gleichmässig treffenden Ursachen beruhen muss, dessen besondere Form aber durch locale Zug- und Druckwirkungen bedingt ist, als welche schon oben der Zug der Kaumuskeln und die Vergrösserung der Zunge bezeichnet wurden. Diese letztere ist es nun offenbar, welche den mittleren Theil des Unterkieferbogens nach vorn vorgeschoben und die übermässige Verlängerung des hinteren Abschnittes des horizontalen Astes, wie auch das Grösserwerden des Kieferwinkels bewirkt hat."†

That a greatly hypertrophied tongue may have had some influence in producing the changes in the face which are described in these cases is not at all unlikely, but I am satisfied that we cannot explain in this manner the condition which we have described in Magrath, or, indeed, the appearances in the Edinburgh acromegalic skull which have been so ably narrated by Dr. Alexis Thomson.

An enlarged tongue may deepen the vault of the palate, but it could not produce an increased vertical depth of the nasal cavities. Further, it might bring about a subluxation of the mandible, but it is hard to understand how it could stimulate to increased and disproportionate growth the basal part of that bone. The part which we would expect to be chiefly affected by lingual pressure would not be the base but the alveolar part, and yet, both in Magrath and the Edinburgh skeleton, this portion of the lower jaw is less affected than the basal part. The fact that both of these individuals died young with all the teeth in place affords us an unusually good oppor-

* "Studii anatomo-patologici sopra un omo devenuto stranamente deforme," &c. Società Medico-fisica Fiorentina, 1877.

† "Ein Beitrag zur Pathologie des Riesenwuchses." Leipzig, 1884, p. 42. It is perhaps right to state that Virchow has stated that he is doubtful whether the case described by Fritsche and Klebs should be considered as being an example of acromegaly.

tunity of studying those changes in the jaws which would appear to be solely dependent upon the progress of the disease. In Broca's* and Klebs' cases, in which almost all the teeth are shed, and the alveolar margins in great part absorbed, other forces come into operation, such as the action of the muscles of mastication, which tend to open out the angle of the jaw and increase the forward projection of the chin. In Magrath and in the Edinburgh skull, the angle of the mandible is very nearly normal. In the former it is, as we have seen, 127°; in the latter 112°·5.

The Cranium.

The cranium would be considered large if it belonged to a man of ordinary height, but for a person of Magrath's stature, it may be regarded as being, if anything, rather small. It presents a cubic capacity of 1600, and a horizontal circumference of 568 m.m. In form it is mesaticephalic and tapeinocephalic, the breadth index being 78·3, and the altitudinal index 70·2.

Byrne has a long narrow cranium, the cephalic index being 70·2, whereas the Edinburgh cranium occupies an intermediate place between the two, and possesses an index of 74.

The antero-posterior or glabello-occipital length of Magrath's cranium is 198; in Byrne it is 215; and in the Edinburgh skeleton 200. In Murphy, the Irish giant, who measured 7 ft. 3⅜ in., the glabello-occipital length during life was 205 m.m.; whilst in Winkelmeier, the Austrian giant, who was 7 ft. 5⅝ ins. in height, the length of the head was 217 m.m.

In Magrath the cranial wall is not excessively thick. The thickest part is found in the frontal region, immediately above the frontal air-sinuses. In texture we can distinguish little difference between the diploe and the outer and inner tables.

The spheno-occipital suture is closed. All the other sutures, with the exception of a small portion of the posterior part of the sagittal, are open. As will be seen from the figure which gives a front view of the skull, the

* "Un Squelette d'Acromegalie." Archives générales de Médicine, vol. ii., 1888, p. 662. (See figure of the skull.)

metopic suture is persistent. The spheno-parietal suture on each side is exceedingly short, whilst the parieto-mastoid suture has grouped around it a regular forest of sharp spiny osteophytes. The lambdoid suture is very complicated, and the Wormian bones in connexion with it are exceedingly small.

It is interesting to note that in the cranium of Byrne the spheno-parietal suture on the right side is also extremely short, whilst on the left side the parietal bone is excluded from the sphenoid by a wide squamo-frontal suture 17 m.m. long.

The air-sinuses are expanded to an enormous extent. We have already referred to the great depth of the maxillary sinuses (55 m.m.). The mastoidal and the frontal sinuses present an even greater degree of dilatation.

The mastoid process on each side has attained a very remarkable size. The free portion of the process projects 1¼ inches from the base of the skull. On the right side a portion of the tip of this projection has been broken off, and through the aperture which is produced we can sound the depth of the particular air-cell opened into. This is no less than 32 m.m. On its outer surface the mastoid presents an irregular osteophytic appearance.

The frontal air-sinuses are also of great extent. Whilst these show themselves on the exterior of the cranium in the form of a very prominent glabella, the superciliary ridges on either side are not high. The forehead, therefore, does not end abruptly in overhanging eyebrows, as in the case of the Edinburgh skull. But the frontal air-sinuses are not limited to the frontal plate of the bone; they are carried backwards along the whole length of the orbital plates.

In Byrne we meet with the same excessive dilatation of the air-sinuses. The frontal cells are enormously expanded, and are visible on the surface in the form of large superciliary ridges overhanging the orbital cavities. The mastoid processes also are peculiarly large, although they do not form so striking a feature as in the skull of Magrath.

The absence of any excessive expansion of the maxillary and mastoidal air-sinuses in the Edinburgh skull, as compared with the acromegalic skull described by the younger Broca, has led Dr. Thomson to believe that this

is due to the youth of his specimen. This cannot be the case, since the patient was 36 years old when he died, whilst Magrath was only 23, and Byrne 22.

The external meatus in Magrath's skull is not expanded, but the external auditory process which surrounds the aperture is thickened, and presents a very irregular margin. Further the passage is elongated, and does not pursue the usual course. Thus it ascends abruptly as it proceeds inward, and then as it nears the tympanum it descends slightly.

The inferior surface of the base of the cranium is very characteristic. The basilar process of the occipital bone presents an arthritic appearance. Its surface is highly irregular from the presence of numerous pits and depressions, and the projection of osteophytic growths. The vascular apertures also are dilated.

Dr. Alexis Thomson has given a careful description of the glenoid cavity in the Edinburgh acromegalic skull. He says:—"The glenoid cavity has a capacity of little less than that of half a walnut, and in shape it resembles a circular fossa rather than a transverse groove. The enlargement of the fossa has occurred at the expense of its anterior boundary, for, in place of the eminentia articularis, there is a large excavation encroaching on the zygomatic process itself on the left side." In Magrath's skull these fossæ have likewise undergone a marked modification. They have retained, it is true, their typical outline, but they are enormously deepened and slightly enlarged by the absorption of a portion of the eminentia articularis. In these deep pits the condyles of the lower jaw are sunk, and the articulation is of such a character that the ordinary movements of the mandible must have been greatly restricted. In fact, protraction and lateral movement must have been almost impossible, so that the only movements which could take place with any degree of freedom at the temporo-maxillary joint were those of elevation and depression. This must have still further aggravated the distressing condition which we have described in connexion with the distortion of the alveolar borders and the contained teeth, and must have rendered mastication an extremely difficult matter.

The foramen magnum exhibits a curious shape (fig. 3, Pl. VII.). In front it presents a narrow bay, 10 m.m. in length, and then it expands into a

posterior circular portion. Its antero-posterior diameter is 42 m.m. The margins of the opening are rendered irregular by bony deposits in the form of osteophytes, and on each side of the narrow anterior bay there is a large warty growth corresponding to the attachment of the check-ligament. It is this irregular projection which, in a measure, is responsible for the narrowing of the anterior part of the foramen. In Byrne's skull the foramen magnum also shows a pyriform outline, but the anterior bay is not so narrow, and opens out more gradually into the wider portion of the aperture behind. The antero-posterior diameter of the foramen magnum in Byrne is 43 m.m.

In the Edinburgh skull the foramen magnum is circular and very small. In fact its diameter is only 33 m.m.

But the most remarkable features on this aspect of the skull of Magrath are the two occipital condyles. They hold the normal position, but instead of being elliptical elevations they are elliptical depressions, both of which are surrounded by high jagged lips. Undoubtedly, the change has been produced by absorption. Still it is curious that the articular surface of each depression should be rough. Unfortunately, the atlas has been lost, so we can form no proper idea of the nature of the articulation. It is probable, however, that the lateral masses of the atlas, instead of being cupped, were elevated into projections which fitted into the occipital depressions. The union between the opposed surfaces must have been of a fibrous nature, and most likely the change is of an arthritic character. We must not omit to mention that in Byrne's skull changes are evident which must be regarded as the initial stages of the process which has led to the modification of the occipital condyles in Magrath. Both condyles are slightly depressed, and a lip of bone surrounds the right condyle. On the left side this bony lip is not so marked.

To the outer side of each condyle of the occipital bone there is in Magrath's skull a low-lying but distinct paramastoid process.

Behind the foramen magnum the area of the supra-occipital bone which lies below the superior curved line is very strongly marked by muscular impressions and ridges, and the occipital crest is particularly salient. These markings point to a disturbance of the balance of the skull on the summit of the vertical column by the increased weight of the facial part of

the head. The muscles inserted into the occipital bone were no doubt strengthened with the view of maintaining the equipoise. Freund,* in a recent paper on acromegaly, refers to the strong development of the sterno-mastoid and trapezius in patients suffering from this disease:—"Am Halse fällt nur die starke Entwickelung der sternocleido-mastoidei, am Nacken die der Cucullares auf."

The floor of the cranium viewed from the interior presents a coarse appearance from the strong manner in which all the natural prominences project into the cavity. The vascular grooves are deep, and the apertures for the emissary veins particularly large. The mastoid foramen is especially expanded. In fig. 3, Plate VII., its wide mouth as it opens into the lateral sinus groove is visible. Here it presents a calibre nearly equal to that of a goose-quill. Its opening on the exterior of the skull is not so large.

But the portion of the cranial floor which at once attracts the eye is the pituitary fossa. I question very much if this has ever been previously seen so large. It would very nearly hold half of a small Tangerine orange. The expansion has been carried to such an extent that it has led to the total obliteration of the sphenoidal sinus, and at one point in the floor there is an elliptical perforation about one quarter inch long through which the fossa would communicate directly with the cavity of the nose were it not covered on the under surface by the expanded ala of the vomer bone.

The floor of the pituitary fossa exhibits a number of deep depressions or loculi separated from each other by salient smooth ridges. From this we may infer that the under aspect of the greatly enlarged hypophysis was lobulated. The dorsum sellae which forms the posterior wall is very nearly completely absorbed. Only the basal part remains, and this is reared erect, and is as thin as paper. Not a trace is left of either of the posterior clinoid processes.

In front, the olivary eminence is completely gone, and the anterior wall of the fossa, formed by an exceedingly thin lamina, bulges forward so as to encroach upon the nasal cavity. This portion of the cavity extends below the posterior part of the floor of the anterior cranial fossa. On the

* Wilhelm Alexander Freund, "Ueber Akromegalie." Sammlung Klinischer Vorträge, No. 329, 30. January 15, 1889, p. 2382.

left side the fossa is bounded by a thin lamina, on the outer side of which there is the groove for the internal carotid artery. On the right side there is no such limitation, and the appearances are such that I am inclined to believe that the enlarged pituitary body bulged outward so as to enclose the right carotid artery, and even extended forward through the sphenoidal fissure into the back part of the right orbit. I have already referred to the great expansion of the right sphenoidal fissure. Cases of acromegaly are on record in which there has been a marked degree of exophthalmos.* It is possible that this may have been produced by the protrusion of a portion of an enlarged pituitary body into the orbital cavity as in the case of Magrath.

In Magrath the optic tract must have been subjected to a great amount of compression by the enlarged hypophysis. It is curious that in no account is any reference made to a defect in his visual powers.

The following are the dimensions of the expanded pituitary fossa both in Magrath and also the Edinburgh skull :—

	Length.	Depth.	Breadth.
Magrath, . . .	38 m.m.	28 m.m.	—
Edinburgh skull, . .	22·5 m.m.	28 m.m.	21 m.m.

The pituitary fossa in the acromegalic skull described by Broca was expanded to an extent equal to that of the Edinburgh skull.

In Byrne's skull the calvaria has not been removed, and the only means which I had of ascertaining the size of the pituitary fossa was: (1) by introducing my finger into the interior of the skull, through the foramen magnum, and exploring with the finger-tip the pituitary region; (2) by illuminating the interior of the cranium by means of a lighted taper introduced into the cavity through the foramen magnum, and then looking through a small aperture which was present on the summit of the cranial

* "Ueber einem Fall von Acromegalie." By Minkowski, Berliner Klinische Wochenschrift, 1877. "A case of Acromegaly." By Rickmann Godlee, Clin. Soc., London, 1888.

vault. By both of these processes I satisfied myself that the pituitary fossa is expanded, but not nearly to the same extent as in the case of Magrath or the Edinburgh skull. When my finger-tip rested on the front wall of the fossa, I pressed downwards heavily on the margin of the dorsum sella; on withdrawal of my finger a mark was visible upon it, corresponding to the edge of that bony plate. By this means I judged the fossa to be about 22 m.m. in length. Its depth is certainly very much less than that of the Edinburgh skull.

Vertebral Column.

All the vertebræ are present with the exception of the atlas. The articulator has been much too liberal in the amount of intervertebral substance which he has introduced between the bodies of the vertebræ. As a consequence of this the length of the moveable portion of the spine has been somewhat exaggerated; but it is evident that some care has been taken to reproduce the curvature which was present during life. In certain regions the bodies of the vertebræ are much distorted, but there are no signs which would lead us to conclude that there had been present a tendency to ossification of the anterior common ligament.

In cases of acromegaly it is usual to find a marked disturbance of the normal curvature of the spine. Magrath is no exception to this rule, and the deviation is of a very peculiar kind. In the cervical region the column formed by the vertebral bodies is straight, with a slight tendency toward a forward concavity; in the dorsal region the column is convex forward; in the upper lumbar region there is a short but sharp backward bend giving rise to a forward concavity; whilst in the lower lumbar region there is a short forward convexity.

There are also two lateral curvatures observable. One in the dorsal region, with the convexity to the left; the other in the lumbar region with the convexity to the right. In connexion with these a considerable amount of torsion has resulted.

In the cervical region the vertebræ have attained a very great development; in fact the strength and massiveness of this portion of the spine constitutes one of the most striking peculiarities of the column (fig. 2, Pl. VIII.).

On close examination the massive appearance is seen to be produced by an extraordinary development of the articular pillars. These have grown to such an extent that they form on each side, when in apposition with each other, two lateral columns comparable with the central column formed by the bodies of the vertebræ. This feature is conspicuous behind as well as in front. The articular pillars project outward beyond the transverse processes. Thus, if we take the transverse measurement of the spine, opposite the fourth cervical vertebra, we find that the total width, from one articular pillar to the other, is 76 m.m.; whilst the distance between the extremities of the transverse processes of the same vertebra is 67 m.m. This is an abnormal condition. In the well-formed cervical vertebra the most distant transverse points are the tips of the transverse processes. Thus, if we take an ordinary fourth cervical vertebra the distance between the extremities of the transverse processes is 63 m.m.; whilst that between the outer aspects of the articular pillars is only 53 m.m.

In the dorsal region the bodies of the vertebræ are adapted to the abnormal forward curvature of the spine. In place of being narrow in front and deep behind, we find that they are modelled on a plan the reverse of this.

In the lumbar region the bodies of the vertebræ are distorted in conformity with the lateral curvature in this portion of the spine.

In the skeleton of the Prussian guard of Frederick II. in the Berlin Museum, we are informed by Zitterland that there is an abnormal curvature of the column, and the bodies of the vertebræ are moulded in accordance with this. Thus, in some cases they are deeper on the left side, and at other times on the right side. This is precisely the condition which is present in the spine of Magrath.

The entire length of the moveable part of the spine amounts to 886 m.m. It is longer than the corresponding part of Byrne's skeleton, which only measures 816 m.m. How far this discrepancy is due to errors of judgment in mounting the spine it is impossible to say, but there cannot be a doubt that in both cases too much artificial material has been introduced between the vertebræ. If we take the stature as being 100, the spine in Magrath is 40·4; whilst in Byrne it is 35·3.

In so far as the different sections of the spine are concerned, we can only obtain approximate results in regard to the proportions they bear to the entire length of the vertebral column. If we reckon the entire length of the moveable part of the spine as being equal to 100, the different sections of the spine in Magrath and Byrne are as follows:—

TABLE VIII.

Proportions of the different regions of Vertebral Column. Length of Spine = 100.

	Magrath.	Byrne.	Average of Six Irish Spines.*
Cervical region, .	19·3	21·4	21·8
Dorsal region, .	51	52·2	46·5
Lumbar region, .	29·7	26·4	31·7

In Magrath there is apparently a shortening of the cervical region and a marked elongation of the dorsal region of the spine. In Byrne there is the same excessive length of the dorsal region, but in this spine it is the lumbar region that is shortened.

We cannot account for this condition in these spines by any intelligible disturbance of the normal growth-changes. At birth the neck is relatively long, whilst the lumbar region is relatively short. In the subsequent growth of the spine these two sections grow at different rates, and in this way attain the adult standard.

Thorax.

Langer believes that in individuals of great stature the thorax is relatively narrow. This is not the case in Magrath. The chest cavity is greatly expanded; at its widest part it presents a girth of no less than 1323 m.m. ($52\frac{1}{8}$ inches). The great size of the chest was also a very notable feature in the Edinburgh case of acromegaly.

* "Cunningham Memoir," No. II. The Lumbar Curve in Man and the Apes, &c., Roy. Irish Acad., by D. J. Cunningham.

The sternum is a large, broad, but well-proportioned bone. Its entire length is 270 m.m., whilst at the level of the junction of the first costal cartilages, the manubrium has a breadth of 100 m.m. The ensiform process is ossified and very large, but the joint between it and the gladiolus, as well as the joint between the manubrium and the gladiolus, are perfectly open. The vertical length of each section of the sternum is as follows :—

Manubrium, ...	74 m.m.
Gladiolus, ...	141 m.m.
Ensiform process, ...	55 m.m.

It is interesting to note that Langer has also observed an increase in the length of the ensiform section of the sternum in men of high stature. He says: "Bemerkenswerth scheint noch die in allen den drei vollständigen, von mir untersuchten Skeleten zu beobachtende Vergrösserung des *Processus ensiformis*, die Ecker und ich auch an lebenden Riesen wahrgenommen haben."

The most notable features in the ribs are: (1) the boldness of their curvature; and (2) the great depth and width of the subcostal grooves. The latter character is also very marked in the Edinburgh skeleton. The costal cartilages are absent.

The Pelvis.

The pelvis is of great size, and its breadth is especially remarkable. The bones are coarsely modelled, and the muscular impressions are conspicuous. In many places it shows in a marked manner arthritic changes; whilst on the dorsum ilii we note roughened patches due to the action of periostitis. The anterior border of the ilium on each side is rendered highly irregular: (1) by a rough depression below the anterior superior spine for the origin of the sartorius muscle; and (2) by a large warty excrescence which occupies the place of the anterior inferior spine, and must therefore be associated with the attachment of the straight head of the rectus and the ilio-femoral ligament. These changes are clearly of an arthritic character. The acetabulum has also a decidedly arthritic appearance; it is greatly expanded but not increased in depth. Its rim is thinned,

and in front is rendered irregular by osteophytic growths. There is no evidence of any part of the cotyloid ligament being ossified. At first sight the great width of the pelvis conveys to the mind an idea of rickets. I am satisfied, however, that the peculiar shape of the pelvis cannot be ascribed to this pathological condition. The excessive pelvic width is produced by a great increase in the breadth of the sacrum, by an elongation of the pubic bones, and by a spreading out of the pubic arch.

The following Table gives some of the more important measurements of the pelvis. These have been taken in the manner recommended by Sir William Turner. In the same Table I have included the corresponding measurements of Byrne* and the Edinburgh skeleton :—

Table IX.

Dimensions of the Pelvis.

	Magrath.	Byrne.	Edinburgh Skeleton.
Breadth	386	380	311
Height,	274	275	233
Breadth-height Index,	**70·9**	**72·3**	**74·9**
Between anterior superior spines,	365	375	271
Between posterior superior spines,	192	—	90
Between ischial tubera,	265	222	166
Greatest diameter of cotyloid cavity,	74	—	64
Transverse diameter of obturator foramen,	67	—	41
Vertical diameter of obturator foramen,	70	—	60
Obturator Index,	**98·5**	—	**68·3**
Sub-pubic angle,	88°	—	73°
Transverse diameter of brim,	217	174	129
Conjugate diameter of brim,	112	158	97
Pelvic Index,	**51·6**	**90·8**	**75·2**
Depth of symphysis pubis,	57	39	50
Depth of pelvic cavity,	125	—	103
Length of sacrum,	112	145	99
Breadth of sacrum,	162	168	121
Sacral Index,	**144·6**	**115·8**	**123·2**

* It is perhaps right to mention that I measured Byrne under peculiarly difficult circumstances. The fog in London was so thick at the time that the Museum was in darkness, and the only light available was that afforded by a lantern. I nevertheless believe the measurements to be accurate.

From almost every point of view the pelvis of Magrath is larger than that of Byrne. The increased dimensions of this section of the skeleton is also a notable feature in the Edinburgh case of acromegaly. In Magrath the most remarkable peculiarity of the pelvis is the extraordinary width of the pelvic brim. The transverse diameter is very nearly twice as long as the conjugate. This is shown by a pelvic index of 51·6. The average pelvic index in the European is 80. In the Edinburgh skeleton there is also a tendency towards the increase of the transverse diameter of the brim, the index being 75, whilst in Byrne it is the conjugate diameter which has lengthened out, the index being 90·8.

The abnormal width of the pelvic cavity in Magrath is in a great measure due to the increased breadth of the sacrum. The normal sacral index in the European is 112, in Magrath it is no less than 144·6. The same increase in the width of the sacrum, but to a much less degree, is seen in the Edinburgh skeleton. The index of this is 123·2. In Byrne the proportions of the bone may be regarded as normal.

Langer, in his observations on giants, lays special stress upon an increased breadth of the hips (erhöhte Hüft breite). He remarks that this character in living giants is unmistakable, and that it is produced not only by pelvic conformation, but also by an increased length of the necks of the femora.

Upper Limb.

In the bones of the upper limb we also find changes which must be ascribed to arthritic disease. These are especially noticeable in the elbow-joint. Here the articular margins are lipped, and the range of movement in the articulation is very circumscribed. Complete extension is an impossibility. During life it is very questionable if Magrath was able to extend the forearm at the elbow joint beyond an angle of 125°. In consequence of this, in the figure of the skeleton (Plate VIII.), both the arm and the fore-arm are fore-shortened, and a proper idea of their proportions cannot be obtained.

Shoulder Girdle.—The left scapula is a good deal damaged, but the right bone is well preserved. In both, the position of the coracoid process is

peculiar. It is bent, so that its extremity looks more directly downward than in the normal bone.

The following measurements were taken from the more perfect right scapula :—

Table X.

Measurements and Indices of the Right Scapula.

Length,	197
Breadth,	142
Scapular Index,	**72**
Infra-spinous length,	151
Infra-spinous Index,	**94**

The scapular indices given in the above table bring out the most notable character of Magrath's scapula, viz. its great breadth. According to Sir William Turner, the mean scapular index in the European is 65·3; in Magrath it is 72. Again, the same authority gives the mean infra-scapular index as 87·8; in Magrath it is 94.

The clavicle is a long, massive bone. The exact measurement cannot be obtained, because on the left side it is absent, whilst on the right side its extremities are broken off. Its length may approximately be said to have been 210 m.m. We have restored it to this length. It presents a curious osteophytic projection on its under surface some distance to the outer side of the rhomboid impression. This must have been developed in connexion with the insertion of the subclavius muscle.

Humerus.—On both sides the upper epiphysis of the humerus is only partially ossified to the shaft. We have already referred to the arthritic changes which have taken place in its lower end. The upper end is, comparatively speaking, free from this pathological condition. In the shaft the only smooth surfaces are the musculo-spiral groove, and those covered by the fleshy fibres of the brachialis anticus, and the inner head of the triceps. Elsewhere the bone shows periostitic deposit, which gives the surface a rough appearance. The nutrient foramina are of huge size. The right humerus is 431 m.m. long; the left 433 m.m. long.

Radius.—In both radii the lower epiphysis is not completely ossified to the shaft. The right bone measures 331 m.m. in length; the left 338 m.m. These measurements I believe to be accurate, but at the same time it is proper that we should mention that in both cases the heads of the bones had been partially destroyed by a previous articulator. The evidence of periostitis is not so marked in the radius as in the humerus.

Ulna.—The shaft of the ulna is also tolerably free from periostitic changes. Its upper end on both sides is greatly expanded. This enlargement has taken place chiefly in the antero-posterior direction. Thus, measuring from the tip of the coronoid process to the posterior surface of the bone, we obtain a diameter of no less than 56 m.m. On the surfaces to which the tendons of the triceps and brachialis anticus are attached there are osteophytic projections. But the most remarkable feature of the ulna is a curious outward bend of its shaft immediately above its lower end. Above this the interosseous space is of great width, and it is by this bend that the lower end of the ulna is brought into contact with the radius. As we have seen, in two notices of Magrath which appeared during his life, the great thickness of the lower part of his forearm is referred to. The condition of the ulna which we have described would to some extent account for this. Certainly, the enlargement of the wrist could not have been produced by the lower ends of the radius and ulna, because these are not disproportionately large.

The right ulna is 366 m.m. in length; the left is 368 m.m. In both radius and ulna there is a marked expansion of the nutrient foramen.

Let us now consider the proportions which the bones of the shaft of the upper limb in Magrath bear to his stature, and also compare them in this respect with the corresponding bones in Byrne and the Edinburgh acromegalic skeleton.

Table XI.

Length of Humerus as compared with the Stature. Stature = 100.

	Length of Humerus.		Relation of Humerus to Stature.	
	Right.	Left.	Right.	Left.
Magrath, . . .	431	433	19·7	19·8
Byrne, . . .	450	430	19	18·1
Edinburgh skeleton, .	348	331	19·6	18·8

Average as given by Topinard, . . . 19·8

In Magrath it will be seen that both humeri present, in so far as their length is concerned, perfectly normal relationships to the stature. In Byrne and the Edinburgh skeleton it is interesting to note that the left humerus is distinctly shorter than the right. In both, the right bone does not present a marked deviation from the normal standard of length; but it will be noticed that the left bone does. In both skeletons the latter, as compared with the stature, is very short.

In Byrne and the Edinburgh skeleton the left radius is distinctly shorter than the right. In Magrath also there is a slight difference between the bones, but this is in favour of the left radius. The length of each radius and its relation to the stature is given in the following Table:—

Table XII.

Length of Radius as compared with the Stature. Stature = 100.

	Length of Radius.		Relation of Radius to Stature.	
	Right.	Left.	Right.	Left.
Magrath, . . .	331	338	15·2	15·5
Byrne, . . .	334	324	14·5	13·8
Edinburgh skeleton, .	267	254	14·6	14·2

Average as given by Topinard, . . . 14·4

These indices show us that in Magrath the length of the forearm in relation to the stature is longer than the average standard which is furnished to us by Topinard. In Byrne and the Edinburgh skeleton the proportions are very nearly normal.

But the relation which both humerus and radius show to the stature must also be tested.

Table XIII.

Length of Humerus + length of Radius compared with the Stature. Stature = 100.

	Right Upper Limb.	Left Upper Limb.
Magrath, . . .	35	35·4
Byrne, . . .	34·4	33
Edinburgh skeleton, .	33·6	31·9

Average as given by Topinard, . . . 33·6

From this Table we see that the shaft of the upper limb in Magrath is relatively longer than the average as stated by Topinard. The shortness of the left upper limb in Byrne and the Edinburgh skeleton is also rendered manifest.

The radio-humeral index also supplies us with some interesting details. In calculating this index we take the humerus as the standard and equal to 100.

Table XIV.

Radio-Humeral Index. Length of Humerus = 100.

	Right Upper Limb.	Left Upper Limb.
Magrath, . . .	76·8	78
Byrne, . . .	74·2	75·5
Edinburgh skeleton, .	76·8	76·6

Average as furnished by Topinard, . . . 73·4

In these skeletons, and more particularly in Magrath, the radius in relation to the humerus is very long. According to Sir William Turner's classification, all the limbs examined, with the exception of the right upper limb of Byrne, are mesatikerkic, and this notwithstanding the fact that Europeans are distinctly within the brachykerkic class.

Hand.—In connexion with the question of acromegaly the dimensions of the hand in the skeleton of Magrath present a peculiar interest. Unfortunately, a considerable number of the bones of the right hand are absent, but in the left hand the middle metacarpal bone alone is wanting. This has been modelled in wood from the corresponding bone of the opposite side, so that the measurements which have been taken may be regarded as being in every respect trustworthy.

Table XV.

Length of the different Segments of the Left Hand.

Middle Column,	
Which includes the semilunar, os magnum, middle metacarpal and the phalanges of the middle digit,	258
Outer Column.	
Outer part—Which includes the scaphoid, trapezium, metacarpal and phalanges of the thumb,	185
Inner part—Which includes the scaphoid, trapezoid and the metacarpal and phalanges of the index digit,	250
Inner Column.	
Outer part—Which includes the cuneiform, unciform, and the metacarpal and phalanges of the ring digit,	220
Inner part—Which includes the cuneiform, unciform, and the metacarpal and phalanges of the little finger,	202

Table XVI.

Length of the Metacarpal Bone and the Phalanges of the different Fingers of the Left Hand.

Thumb,	142
Index,	217
Medius,	223
Annularis,	187
Minimus,	171

The chief interest of this question, however, is centred in the relation which the length of the hand bears to the stature. The following Table brings this out, not only in Magrath, but also in Byrne, Winkelmeier, and Murphy. Unfortunately, the dimensions of the hand in the Edinburgh skeleton are not available.

Table XVII.

Length of the Middle Column of the Hand compared with the Stature.
Stature = 100.

	Length of hand.	Relation to Stature.
Magrath,	258	11·8
Byrne,	263	11·3
Winkelmeier,*	261	11·4
Murphy,*	245	11

Average as stated by Topinard, . . . 11·7

These indices would seem to indicate that in all of these giants the length of the hand is in proper proportion to the stature. It must be borne in mind, however, that in the case of Winkelmeier and Murphy, the measurements were taken during life, whilst in Byrne and Magrath the measurements have been made on the skeleton. We have no information in regard to the size of Byrne's hands during life; but in the case of Magrath the great size of the hand is specially alluded to. We are told that his hand was as "big as a middling shoulder of mutton"; that his wrist was "10½ inches thick"; and that "his middle finger was as long as

* Measured during life by Virchow.

the hand of a full-grown man." Further, Dr. Bianchi, of Remino, gives us the precise length of Magrath's hand. He states that it measured one Parisian foot (*i. e.* 12·78918 inches, see p. 563). If this be correct, the length of the hand, as compared with the stature, far exceeds the average, the proportion being 14·8 : 100.

We know that in acromegaly the enlargement of the hands is chiefly due to an increased growth of the soft parts, and that little or no trace of this hypertrophy may be visible in the bones, and we have the very typical acromegalic skeleton in Edinburgh as a case in point. Dr. Alexis Thomson tells us that "the bones of the wrist and hand show but little evidence of having belonged to a subject on whose hands the epithet of 'enormous' had been bestowed by those who saw the man during life." The epithet referred to was applied to the hands of this case independently by Dr. Claud Muirhead who saw the patient during his life, and by myself, who had the opportunity of examining him after death in the Edinburgh dissecting-room. I have still a vivid recollection of the extraordinary size of the hands in this man. Under these circumstances I do not consider that the absence of any decided enlargement of the bones of the hands in Magrath can be urged as a reason against our regarding the case as one of acromegaly.

There is little trace of arthritic disease in the bones of Magrath's hands. The prominences of the carpus are exaggerated, and the pisiform is remarkably large, but the articular ends of the metacarpal bones and phalanges are almost entirely free from projections of new bone.

Lower Limb.

Femora.—The femora are very far from being symmetrical. There is not only a difference in the length of the two bones, but also a decided difference in their configuration. The left femur is 21 m.m. longer than the right, and deviates much more from the normal shape. This deviation is particularly noticeable in the upper and lower extremities. Thus, the neck is exceedingly slender, is longer than in the right femur, and joins the shaft at a more open angle. On the right side the angle is 130°; on the left side 140°. The head also is placed upon the neck in a different manner in the two bones. In the left femur it is developed more upon the

posterior aspect of the bone, and looks more directly upward. Two-thirds of the articular surface is placed behind the highest point of the head. In the right bone the head holds the normal position.

In both bones the digital fossa is of great size, and exceedingly deep. The great trochanter is very massive, and the muscular impressions upon it are strongly marked. In the right femur the small trochanter is large, and presents the usual position and direction: in the left bone it is relatively small, and is pulled round to the front. In both bones a third trochanter is present. In the left femur this is feebly marked, but in the right bone it forms a very evident projection.

The shaft of the bone in both cases is clumsy, and exhibits a small degree of curvature. In its upper two-thirds it is massive and strong, but in its lower third it becomes relatively slender and weak. The most notable feature of the shaft is the linea aspera. In both bones this is enormously strong, projecting, and thick. When the shaft is viewed in profile it descends perpendicularly, and thus obliterates the natural posterior concavity. This is highly suggestive of early rickets, but in the absence of a corresponding degree of forward convexity of the shaft, I am not inclined to believe that the condition of the linea aspera is due to this cause. The nutrient foramina are greatly expanded, and along the lines of tendinous and ligamentous attachment there is distinct evidence of periostitic action.

The lower ends of the femora show in a marked manner the condition which we associate with *genu valgum.* The internal condyle is extremely long, while the external condyle is very short. The deformity is much greater in the left bone than in the right. In neither case is there any evidence of this condition being due to an original obliquity of the epiphysial line, as both the condyles descend along lines which are parallel to the long axis of the shaft of the bone. It is more than possible that the extreme width of the pelvis may in some measure be responsible for the deformity.

Langer tells us that evidence of *genu valgum* seldom fails in giants. "A high degree of *genu valgum* is present in the St. Petersburg giant, and in the Berlin skeleton No. 3040."

In the lower extremities of Magrath's femora the arthritic changes are more marked than in the upper extremities. The articular surfaces are smooth, but their margins project in the form of high ridges.

Table XVIII.

Length of the Femur.

	Right.	Left.
Magrath, . . .	603	624
Byrne, . .	625	642
Edinburgh skeleton, .	479	487

In each of these skeletons the left femur is distinctly longer than the right; and in the Edinburgh skeleton the femur is relatively short as compared with the stature. Assuming the stature to be 100 the femur in this case is only 26·1 on the right side, and 26·6 on the left side. As we have noted the normal proportion is 27·7.

Tibia and *Fibula.*—The important investigations of Langer into the conditions of giant-growth have led him to believe "dass der Querschnitt der röhrigen Knochen nicht in gleichem Masse, wie die Ausdehnung in die Länge zunimmt, sogar im Verhältniss zür Länge abnimmt. Je länger also der Knochen wird, desto mehr verliert er an Dicke und damit an Festigkeit. So bringt also der Riesenwuchs nicht nur ein Missverhältniss in den Formen, sondern auch in der Einrichtung des Mechanismus mit sich." I cannot say that the long bones in Magrath's skeleton in every respect bear out this statement. In the femur, as we have noticed, the lower third of the shaft is relatively weak, but in its upper two-thirds it is disproportionately thick and massive. The same also is the case with the tibia. The shaft in its upper three-fourths presents an unusual degree of strength. At the middle of the shaft its girth is no less than 120 m.m., and this, when compared with the length of the bone, may be considered to be, if anything, rather in excess of the normal proportions. The anterior border or shin is particularly strong and projecting. In its lower fourth,

however, the shaft of the tibia is decidedly weak and narrow. The fibula, however, is weak throughout, and this is more especially noticeable toward the head, where it is extremely slender. It is further evident that in its growth in length the fibula has not kept pace with the tibia. The upper extremity of the right fibula falls short of the external tuberosity of the tibia, and in consequence the usual articular surface is absent in both bones. The left fibula is slightly longer, and an articulation is effected, but the surfaces involved are extremely small. As is well known, the upper tibio-fibular joint presents, even under ordinary circumstances, many variations, and it is not uncommon to find, as in the case of the right lower limb of Magrath, merely a fibrous connexion established between the two bones. Indeed the appearances met with would seem to indicate a tendency in man towards the gradual disappearance of the upper end of the fibula.

In Magrath the right fibula is 485 m.m. long; the left 490 m.m.

In both the tibia and fibula the extremities are more or less deformed by arthritic changes which have led to a lipping and undermining of the articular surfaces and the outgrowth of osteophytic projections. The entire extent of the popliteal surface of both tibiæ is roughened by periostitic action. The same changes are present at various points on the shaft and also on the fibula.

In the following Tables the length of the tibia as compared with the stature of Magrath, and also that of the tibio-femoral index are given:—

Table XIX.

Length of Tibia compared with the Stature. Stature = 100.

	Length of Tibia.		Relation of Tibia to Stature.	
	Right.	Left.	Right	Left.
Magrath, . . .	506	504	23·2	23·1
Byrne, . . .	541	537	23·6	23·4
Edinburgh skeleton, .	402	392	21·9	21·4

Average as stated by Topinard, . . . 22·4.

Table XX.

Tibio-Femoral Index. Femur = 100.

	Right.	Left.
Magrath, . . .	83·9	80·7
Byrne, . . .	86·5	83·6
Edinburgh skeleton, .	83·9	80·5

Average as furnished by Humphry and Topinard, . . 80·5.

From these Tables it will be seen that the tibia presents a relatively greater length, both as regards the stature and the femur in Magrath and Byrne, than the normal bone. In the Edinburgh skeleton it is short as compared with the stature, whilst the tibio-femoral index is precisely the same as in Magrath. Sir William Turner by means of the tibio-femoral index marks a division between different races. Those in which the index is 83 or upwards he places in a "long-legged" or dolichoknemic class. Judged by this standard the indices furnished by the bones of the right lower limb show that the three skeletons under consideration all belong to this group. Europeans, as a rule, belong to the brachyknemic variety.

In Magrath the intermembral index on the right side is 68·6, and on the left side 68·3. According to Flower the average European intermembral index is 69·2.

Patella.—The patella is very large, and the non-articular part of its surface is rendered rough and irregular by the outgrowth of osteophytes. The vascular openings are also greatly expanded. On the left side, only the lower half of the bone is present.

Foot.—The bones of the feet are greatly altered. It is in this portion of the skeleton that the arthritic disease has attained its maximum degree of intensity. In fig. 3, Plate VIII., the appearance presented by the astragalus, scaphoid, and internal cuneiform bones is given. It will be seen that they are distorted, and the surfaces are covered by pit-like depressions

and osteophytic projections. The bases and heads of the metatarsal bones are likewise greatly enlarged, and exhibit similar changes. The first metatarsal bone and its proximal phalanx are remarkable on account of their massive size and the great expansion of their extremities. But in addition to all this the foot shows on each side a certain degree of distortion from another cause. The growth of its several bones has not been uniform. Some of the bones, such as the os calcis, astragalus, scaphoid, and internal cuneiform, are disproportionately large, whilst the others are relatively small.

Unfortunately all the phalanges, with the exception of the proximal phalanx of the great toe on each side, have been lost. It is impossible, therefore, to arrive at the exact length of the foot. Measured from the heel to the extremity of the great toe we obtain a length of 300 m.m., or $11\frac{3}{4}$ inches. In this measurement I have allowed 32 m.m. for the ungual phalanx. I believe this to be a moderate allowance, seeing that the proximal phalanx is 48 m.m. long.

Table XXI.

Length of Foot in relation to Stature. Stature = 100.

	Length of Foot.	Length of Foot compared with the Stature.
Magrath, . . .	300 m.m. or $11\frac{3}{4}$ in.	13·7
Byrne, . . .	317 m.m. or $12\frac{1}{2}$,,	13·8
Murphy,* . . .	310 m.m. or $12\frac{1}{4}$,,	13·9
Winkelmeier,* . .	358 m.m. or $14\frac{1}{8}$,,	15·7

Average as supplied by Topinard, . . . 15·4.

Judged by the bones the length of the foot in both Magrath and Byrne, in relation to the stature, falls considerably below the average. Murphy, during life, appears to have had relatively a very small foot. In Winkelmeier the normal proportions are exhibited.

But in the foot as well as in the hand, when we are dealing with a case of suspected acromegaly, we cannot rely upon the bones for the restitution

* Measured by Virchow during life.

of the proportions as they existed during life. In acromegaly the hypertrophy of the foot is chiefly confined to the soft parts. As it so happens, we have the means of ascertaining in an approximate manner the length of the foot of both Magrath and Byrne during life. The great size of both the feet and hands of Magrath attracted the notice of those who described him during his life; and we are informed that the last of his shoe was 15 inches long. If this be case the proportion exhibited by the length of the foot to the stature is 17·5, which greatly exceeds the normal proportion. Then, in regard to Byrne, we have still more direct evidence; for, preserved along with the skeleton in the College of Surgeons' Museum, we find the boots and slippers which he wore during life. This, of itself, would seem to indicate that the great size of the feet was specially noticeable. The soles of the boots are $15\frac{1}{8}$ inches long; and of the slippers, $15\frac{1}{4}$ inches long. Taking the proportion of the feet to the stature from these, we obtain an index of 16·7, which is distinctly in excess of the normal proportion.

I have expressed the opinion that Magrath during life was afflicted with acromegaly; and that his skeleton shows in a marked manner changes which are due to the action of this disease. Although I have indicated, at various stages throughout this article, the grounds upon which I have based this view, it might be well that I should now briefly summarize the more important of these. They are as follows:—

1. The disproportionate size of the face in relation to the cranium. This increase is present not only in the maxillary, but also in the mandibular part of the face, and, as a result, we have an excessive depth of the orbital openings of the nasal fossæ, and of the maxillary air-sinuses. The extraordinary size of the mandible is particularly suggestive.

2. The great size of the mastoid processes, and the great expansion of all the air-sinuses of the skull.

3. The hypertrophy of the pituitary body, and the accompanying expansion of the pituitary fossa.

4. The evidence which we have that both hands and feet were exceedingly large during life, although the bones show no trace of this hypertrophy.

But the determination of the condition is rendered peculiarly difficult from the fact of these changes being present in an individual of so great a stature as Magrath. Virchow entertains the view that there is no connexion whatever between the partial giant-growth, which is seen in ordinary cases of acromegaly, and general giant-growth; and yet, if we study the characters of the skeleton in individuals of high stature, as given by Langer, we perceive many points of correspondence. The latter author tells us:—

1. That in the skulls of all giants the mandibular region is relatively large; and in most, the lower jaw is "monstrous." Further, the lower jaw frequently exceeds the maxilla in its growth, so as to produce a great projection of the chin, and to bring the lower teeth in front of the upper teeth. He figures such a skull.

2. That the increase in growth of the giant's skull affects, as a rule, only the facial portion. As a consequence of this the cranium remains small, whilst the face becomes enlarged. He considers, however, that this excess of growth of the face is limited to its lower part, and does not affect the orbital openings nor the upper part of the nasal cavities.

3. That in typical cases of general giant-growth there is found a swelling of the pituitary body, whereby the fossa becomes expanded, and also a hypertrophy of the soft parts of the face, *e.g.* the lips and alæ of the nose. The expansion of the pituitary fossa he has chiefly observed in cases where the mandible was of enormous size.

These observations of Langer have an important bearing upon the question under consideration, and I believe that they point to some kind of connexion between acromegaly and general giant-growth. Of course a disproportion between the face and the cranium may be brought about in two ways. It may be produced by an excessive growth of the facial bones, whilst the cranium maintains its normal standard. This is the true acromegalic disproportion. But it may also be brought about by a failure on the part of the cranium to keep pace with the general growth of the other parts of the body. In this case the growth of the face goes on independently, and in harmony with the general growth of the individual. This is the manner in which the disproportion peculiar to giants is produced.

The results are precisely the same, and yet the manner in which they are brought about is different.

But even accounting in this way for the same form of skull occurring in the two cases, how can we explain the fact that in acromegalic patients and in giants we have the same tendency to expansion of the pituitary fossa, and excessive growth of the mandible. Langer is not the only author who has drawn attention to this exaggerated mandibular growth in giants. Topinard also refers to it.

It must not be thought from what I have said that I wish to make out that all giants are acromegalic. In neither Winkelmeier nor in Murphy is there apparently the slightest trace of this disease. The face in neither of them is disproportionately large, nor are the hands and feet increased in size. In fact, in Murphy all these parts are relatively small.

As to Magrath, however, I believe that there cannot be a doubt. Although he is the shortest of all the giants we have had under our consideration, the size of his face far exceeds that of the others.

The skeleton of Byrne offers greater difficulties. In this skull we have no excessive enlargement of the face in relation to the cranium. It is even smaller than the average, when considered in its relation to the stature. But, on the other hand, we have a great mandibular growth, an expanded pituitary fossa, and the direct evidence which is afforded by his boots, that his feet, during life, were of great size.

I may be allowed to suggest a new and a better term for the disease than "acromegaly." I have already characterized this word as being clumsy and badly constructed. Dr. Haughton and Dr. Ingram have furnished me with the much more correct term of "megalacria."

In conclusion, I would wish to express to Dr. E. Perceval Wright, the Secretary of the Academy, my best thanks for the help which he has given me in the preparation of this Paper. Not only has he assisted me in my search after records bearing upon Magrath, but also with many useful suggestions in connexion with the treatment of the subject.

EXPLANATION OF THE PLATES.

PLATE VII.

THE SKULL OF CORNELIUS MAGRATH FROM DIFFERENT POINTS OF VIEW.

Figure
1. Profile view of the skull.
2. Front view of the skull.

Figure
3. The floor of the cranium.
4. The base of the skull.

PLATE VIII.

1. The entire skeleton of Cornelius Magrath.
2. Front view of the cervical vertebræ.
3. Certain of the bones of the right foot, viz. the astragalus, scaphoid, internal cuneiform, a portion of the middle cuneiform, and the base of the first metatarsal.
4. The two femora, as seen from the front.

The different figures in these Plates were drawn upon the stone from photographs which were taken by J. E. Joly, M.A., Assistant to the Professor of Natural and Experimental Philosophy in Trinity College, and I have to express to him my best thanks for the trouble he took to supply me with suitable negatives and prints.

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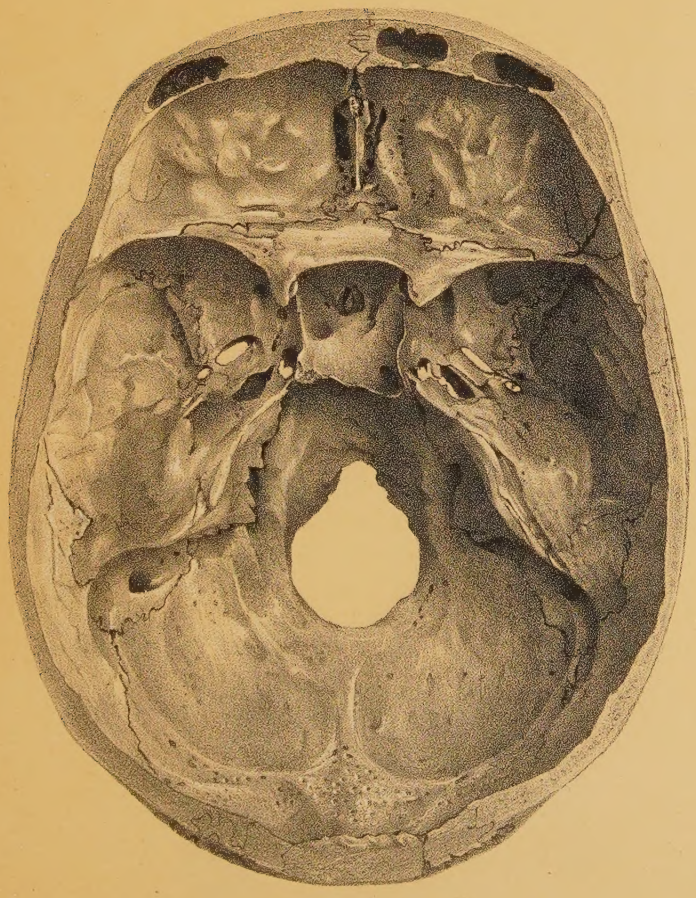

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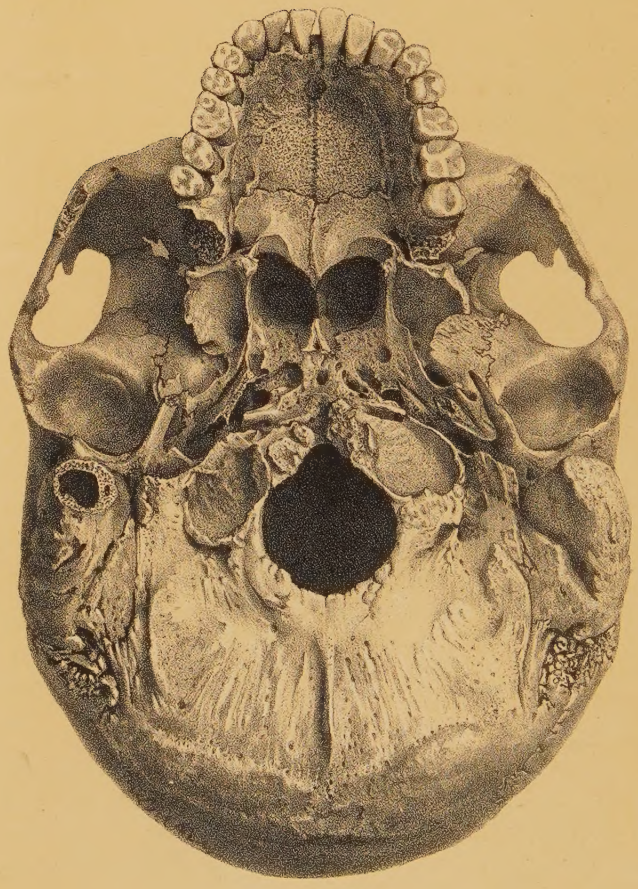

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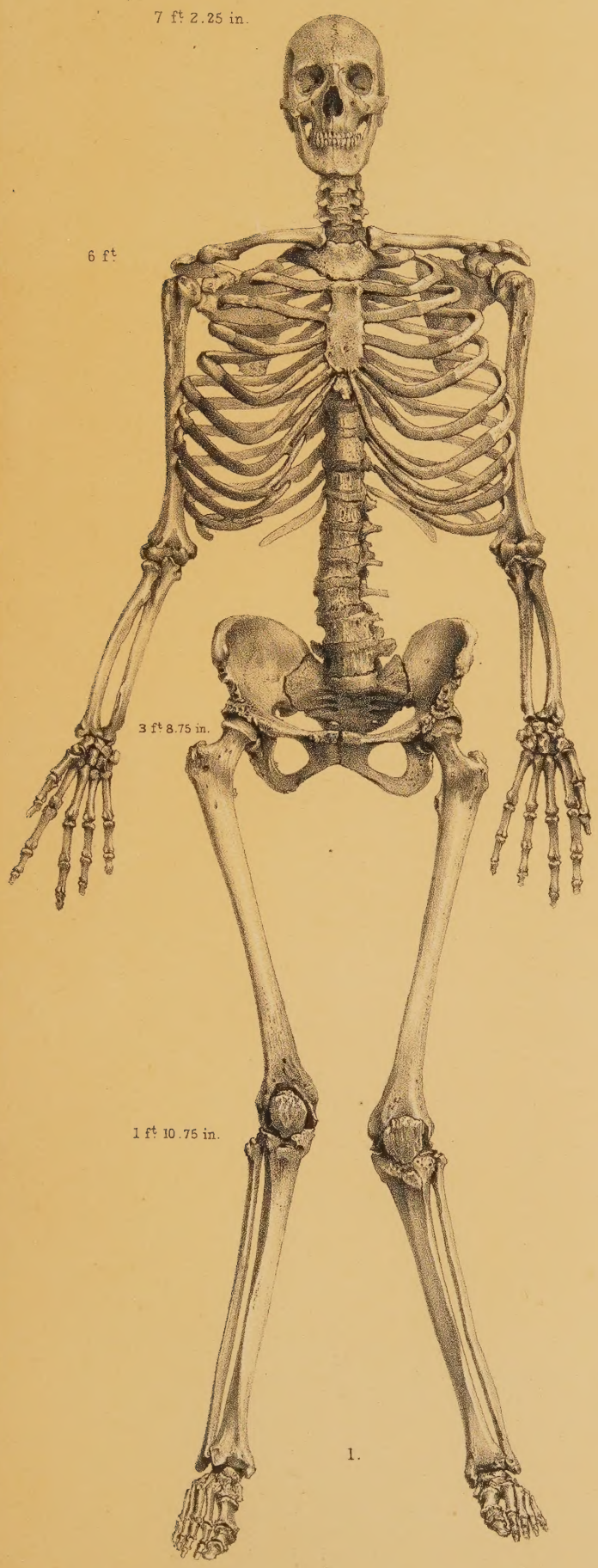

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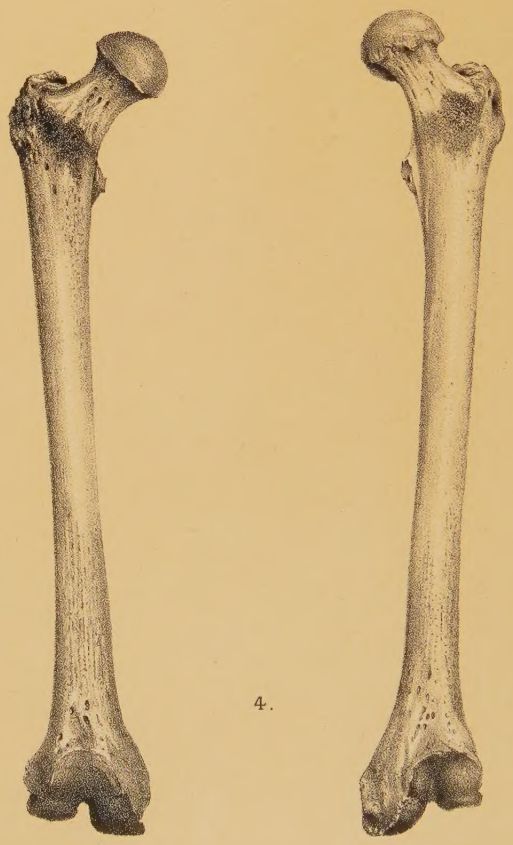

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